THE FOUNDRY

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SCULLIN STEEL • COMPANY •

ST. LOUIS

LINOIL

WITH the wheels of industry turning fast, and being geared to turn much faster, foundrymen ruthlessly discard old notions of favorite core oils and turn to Linoil which proves itself in every precision test.

Three high spots easily testable are Linoil's binding strength, Linoil's low gas production, and Linoil's quick cleanout. Three qualities ranking next are quick oven turnover, center drying, accelerated work at bench. Linoil's most shining virtue, uniformity, is not so quickly tested but a host of reliable foundrymen vouch for Linoil's past record.

It is obvious that the price per gallon of core oil is of minor consequence, the real cost being determinable only in appraising performance at point after point thru the foundry.

If you are using a ratio of 40 to 1 and by changing to Linoil you step down the oil ratio to 60-1 that gives you five tons more cores to the drum. The drier sand on the bench gives you less box cleaning, and your ovens will dry two barrels of oil with less fuel than three.

In the mold where the dried oil is turned swiftly to ash and gas, the smaller amount of Linoil-caused gas has less-clogged channels between the grains of sand for orderly travel to the proper exits, and less tendency to go thru the wall of the casting.

Cleaning room time is important both in the operating cost and in speeding castings to the shipping platform, so your cleaning room time is something to watch when testing Linoil.

Over and above all this is the certainty that you are not going to have a costly tie-up in the middle of a job because the core oil was a little different. Linoil is uniform.

Ask for a demonstration today or order Linoil and test it at once. It pays to know.

MAKING CAST STEEL BOMBS

STEEL FOUNDRY
BOLSTERS
SIDE FRAMES
STEEL CASTINGS

SCULLIN STEEL CO.
STEEL PRODUCTS
GENERAL OFFICE AND WORKS 6100 MANCHESTER AVE
ST. LOUIS

October 29, 1941.

Mr. Louis F. Ferster,
Advertising Manager,
The Werner G. Smith Co.,
2191 West 110th St.,
Cleveland, Ohio.

Dear Sir:

For more than fifteen years we have been users of Linoil and we might add that we are very fussy about our core oils. We want a maximum amount of strength with a minimum amount of smoke and gas.

Linoil was used by us in the manufacture of hundreds of thousands of bombs and has done a swell job.

We have tried many other brands but we always wind back up with Linoil.

Yours very truly,

Joseph D. Walsh,
Works Manager.

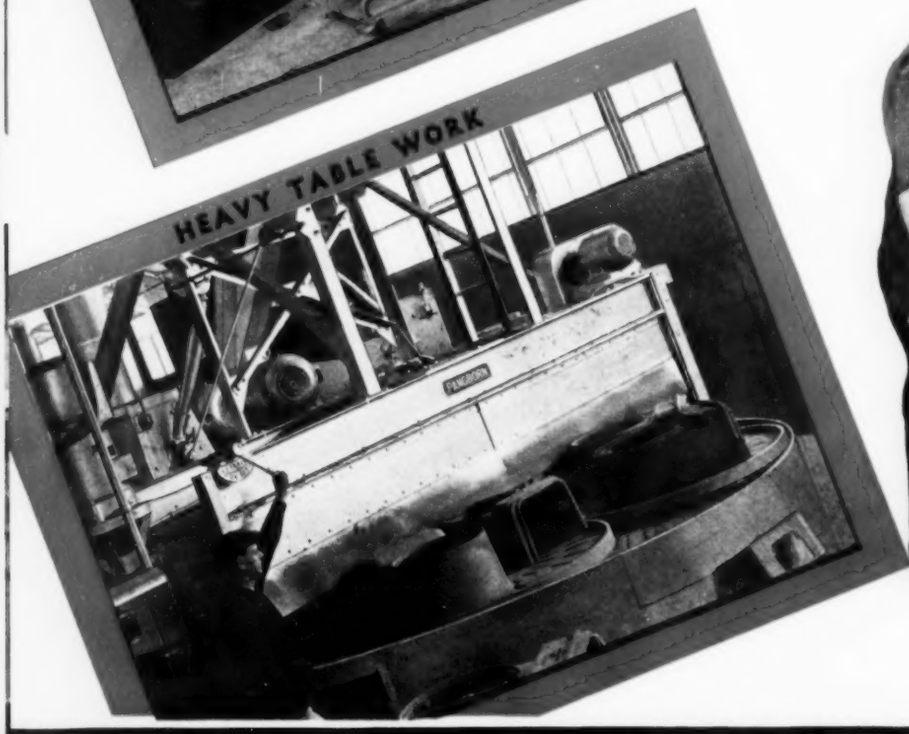
THE WERNER G. SMITH COMPANY

(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

2191 West 110th Street — Cleveland, Ohio

SAY "ROTO

FOR B



New 3½ cubic foot capacity ROTOBLAST Airless Barrel.

WORLD'S LARGEST MANUFACTURER OF BLAST

PANG

PANGBORN CORPORATION . . . . . .

BLASTING

BETTER, QUICKER RESULTS

"ROTOBLASTED" WORK ASSURES EASIER MACHINING, FINER FINISHES

"ROTOBLASTING" is the easy way to say airless blast cleaning. Many men in foundries, forge shops, heat-treating departments, etc., use "ROTOBLASTING" as an expression meaning a better way to clean their work—a better way to produce bright smooth surfaces free from scale and dirt for finishing, machining, grinding, metallizing parts, etc.

SAVINGS

"ROTOBLASTING" has proven a surprising money saver in many ways. It has cut cleaning time and lowered cleaning costs as much as 50% in many applications. It is doing work three times as fast as former methods. It reduces labor requirements, lowers power costs, and increases production schedules as much as 200%.

ADAPTABILITY

The "ROTOBLAST" unit provides better and quicker cleaning of castings, forgings and hundreds of parts such as sanitary ware, side frames, bolsters, stove parts, cylinder blocks and other automotive parts, gun mounts, shells, bombs, tank parts, car wheels, oil pump valves, tools, radiator sections, ordnance forgings, armor plate, etc.

ENGINEERING

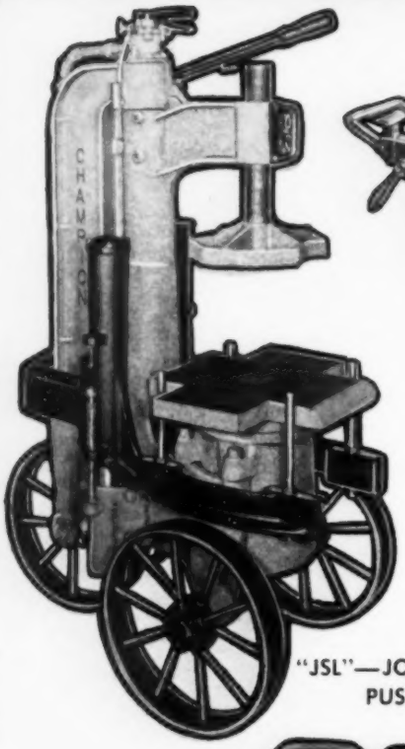
Pangborn engineers are conveniently located to work with you or your representatives in making proposals to suit any of your blast cleaning or dust control requirements. These men are all specialists in these fields—and their many years of successful experience qualifies them to serve you to your most profitable interest. No obligation for consultation or suggestions, of course.

FOR NEW EQUIPMENT—OR FOR SUGGESTIONS ON HOW TO IMPROVE YOUR WORK—OR HOW TO LOWER YOUR PRESENT COSTS—"COME TO PANGBORN"

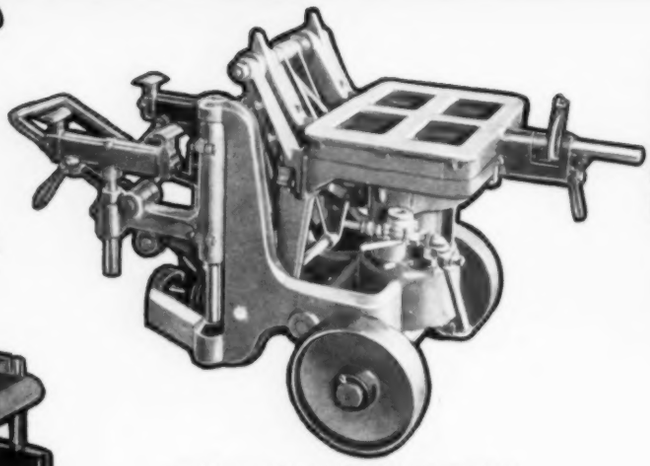
CLEANING AND DUST CONTROL EQUIPMENT

PANGBORN

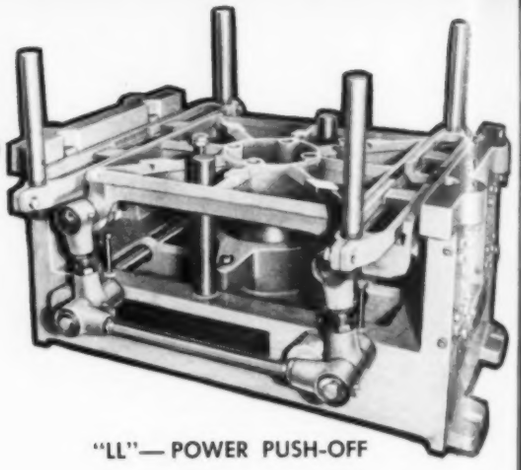
HAGERSTOWN, MARYLAND



"JSL"—JOLT SQUEEZE PUSH-OFF



"JM"—JOLT ROLLOVER DRAW



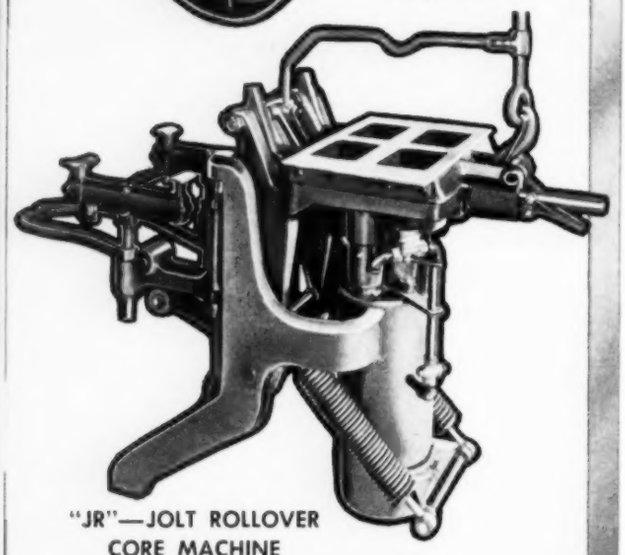
"LL"—POWER PUSH-OFF

THERE IS NO SUBSTITUTE FOR EXPERIENCE

Why not take advantage of our forty-four years experience in the design and manufacture of production molding and core machines.

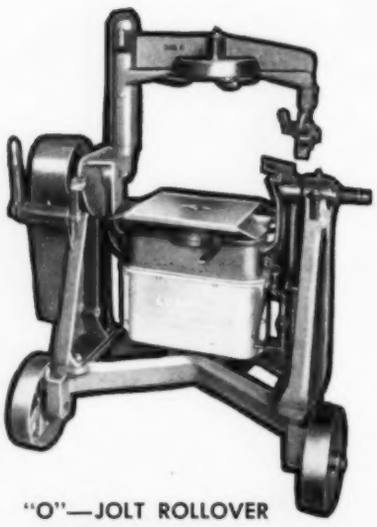
CHAMPION offers you reliable engineering service without obligation. It is our job to study your molding and core production problems and make proper recommendations.

Here are shown a few of the many types of molding and core machines we manufacture.



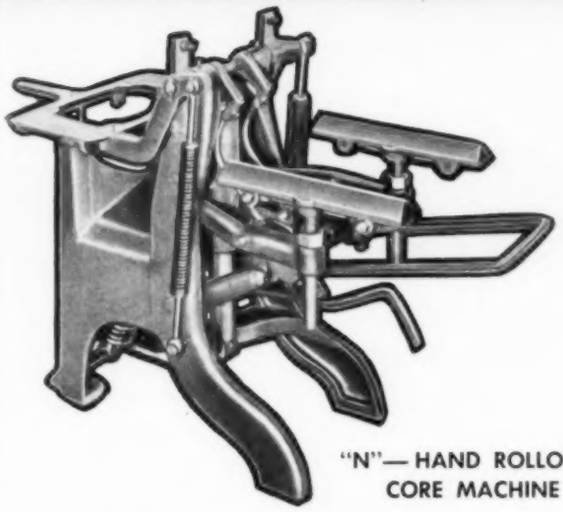
"JR"—JOLT ROLLOVER CORE MACHINE

"J5"—PORTABLE JOLT SQUEEZER

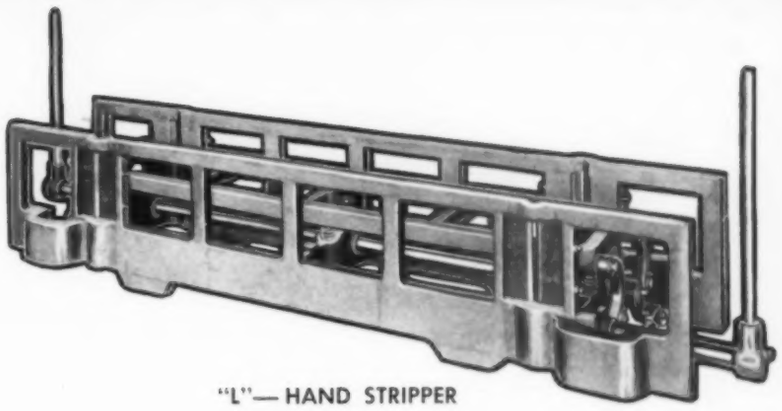


"O"—JOLT ROLLOVER CORE MACHINE

"CB"-8—CORE BLOWER



"N"— HAND ROLLOVER CORE MACHINE



"L"— HAND STRIPPER

Every installation by CHAMPION is unconditionally guaranteed.

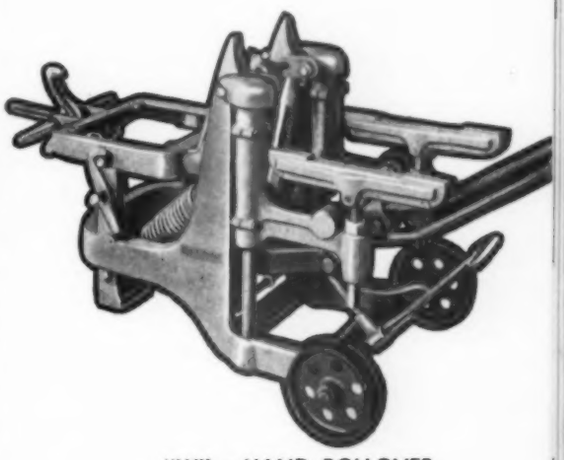
We don't mean guaranteed merely "against defects in workmanship or materials" either. We mean that your installation of CHAMPION equipment will be guaranteed to do the job you expect it to do, in the manner you want it done — in other words you must and will be 100% satisfied.

Yours for Defense

CHAMPION FOUNDRY & MACHINE COMPANY

1318 WEST 21st STREET • CHICAGO, ILLINOIS

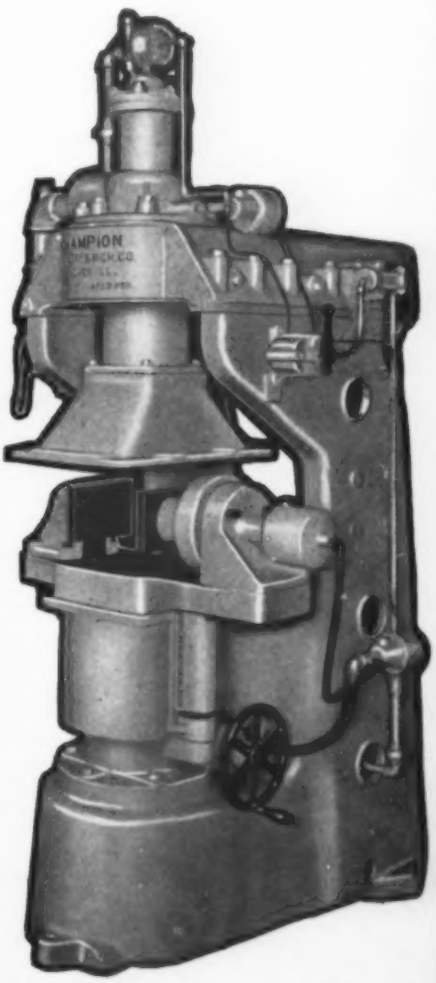
Manufactured in Canada by John T. Hepburn, Ltd., Toronto, Canada



"W"— HAND ROLLOVER

"C"— PLAIN JOLT

"JS"— STATIONARY JOLT SQUEEZER



"CB"-10 — CORE BLOWER

Another MALLEABLE IRON FOUNDRY Increases production—Cuts Costs

• *Shown directly below is a view of the shakeout which separates the sand and castings. The sand is delivered to a magnetic belt conveyor, elevated and screened through a rotary hexagonal screen with fines control, then to a spreader for cooling before being delivered to a sand storage bin. No "hot sand" troubles are encountered in this properly designed unit. After the shakeout, castings are delivered through one side to an overhead carrying conveyor, (which permits cooling near the roof) and distributed to sprue benches and cleaning room. Shown above is a general view of the operating floor.*

• *Shown above is a part of the conveying system at this malleable foundry. Each molding station has two roller conveyors working out, with one conveyor returning bottom boards for each pair of molders. Note the hinged steel hatches built flush with floor. These hatches are swung back against the conveyors (as indicated by the dotted lines) and are used as chutes for sand and castings, which drop to a conveyor below the floor, thence delivered to shakeout screen. Bottom boards are retained by angle irons and returned to conveyor.*

• *At the right is a view of the new 5 ft. dia. pan Simpson Intensive Mixer, which was first designed and built to meet foundry sand mulling requirements for the U.S. Navy. This modern unit has a capacity of 8 to 10 cubic feet, and is now made available for all general foundry use.*

with a NATIONAL SAND SYSTEM and SIMPSON INTENSIVE MIXERS

THE illustrations on the opposite page show part of the second complete unit installed at this malleable production-jobbing foundry. It represents a unit "Engineered for the Job." Since the installation of this modern sand conditioning, sand and mold handling unit, in this foundry, it has been possible for only 16 molders to produce enough molds to require approximately 50 tons of melt per 8-hour day. In addition, the overall efficiency of the complete system is revealed in the fact that the total of direct and indirect labor is a fraction of that formerly required per ton of good castings produced.

To make sure that all sand meets the required specifications, every ton used is cleaned, screened, cooled and mulled in Simpson Intensive Mixers, then aerated in a National Aerator. Two No. 2-6 ft. dia. pan mixers are installed. These two units each have a capacity up to 20 tons per hour, and are both operated by one man, operating in 2-minute mixing cycles on 1200 to 1500 lb. batches. Here, then, is further proof that when it comes to Increased Production—High Quality—Better Products — Lower Scrap and Lower Costs — it's hard to beat the advantages offered through the installation of National Sand Systems plus Simpson Intensive Mixers. Our complete engineering staff is at your disposal, without obligation — why not take advantage of this service?

SIMPSON INTENSIVE MIXERS

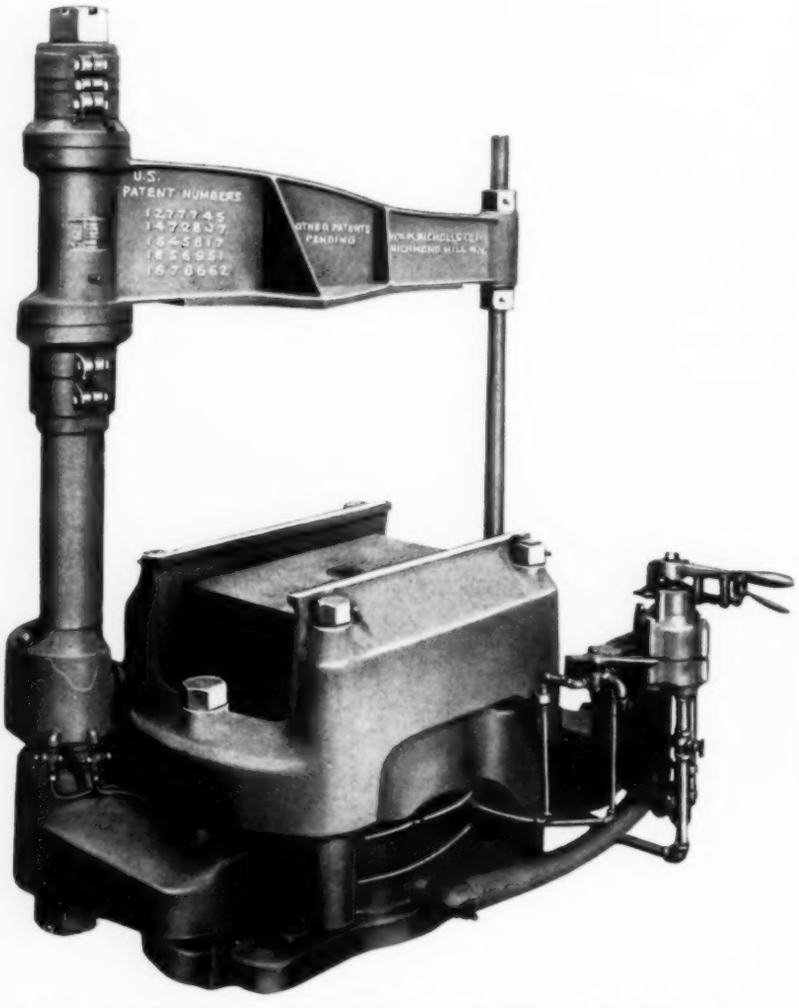
NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries:—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

MOLDING MACHINES

. . . designed for quality---



16-36 Type D Heavy Duty Jolt Squeeze Molding Machine with Pattern Drawing Device—Open End Frame— 7" diameter jolt piston—16" diameter squeeze piston.

FOR YEARS — NICHOLLS Heavy Duty Production Machines have given a tremendous amount of service to their users.

TODAY—More than ever—foundrymen must rely upon their molding equipment to meet defense production schedules. They cannot afford to have a breakdown! These machines have played an important role in the success of many large foundries all over the world. This international acceptance is due to their ability to "stand up" under the heaviest production.

Our Type D Molding Machines are built in nine sizes.

We invite you to write for particulars on the NICHOLLS 1942 model production line of Molding Machines.

NICHOLLS

FOR PEAK PRODUCTION

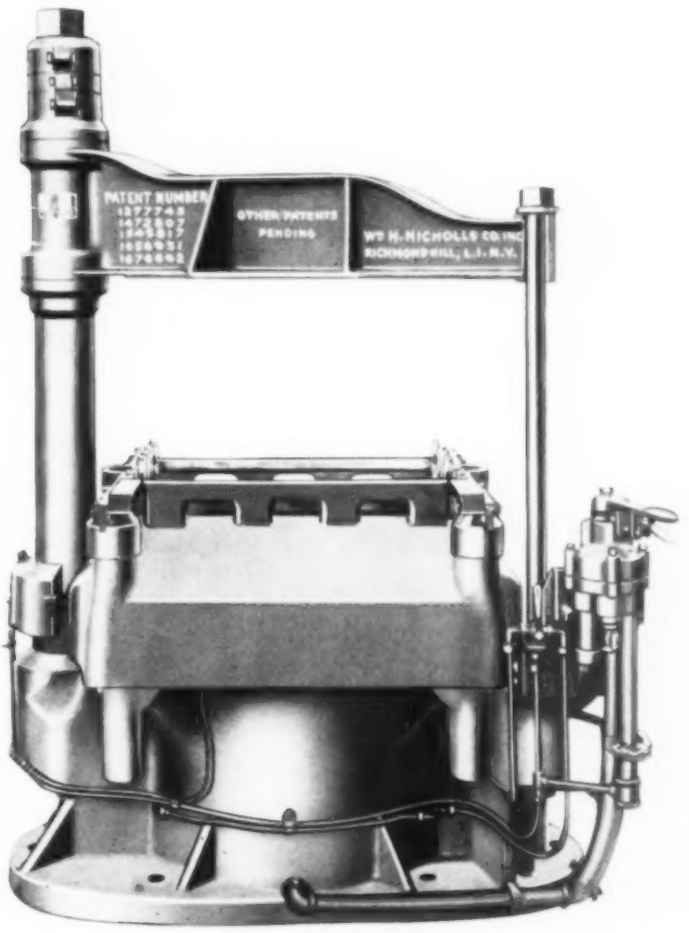
quantity and consistency

We guarantee the workmanship in NICHOLLS Molding Machines to be the best obtainable. Our pistons and cylinders are finish ground to size, which closes up the pores in the casting and does not allow a film of dust to deposit itself upon the finished parts to form a lap, causing rapid wear, which happens when these parts are only smooth turned.

All draw pins, guide pins, bushings and other drawing parts are case hardened and finished in grinders to micrometer sizes for perfect fit, with tolerances allowed only for smooth operation.

The working surfaces being ground to within .002" tolerance are all scientifically lubricated for smooth operation and long life.

The forced lubrication system oils the jolt and squeeze pistons above, as well as below the rings. All pins are continually operating in oil by means of dash pots.

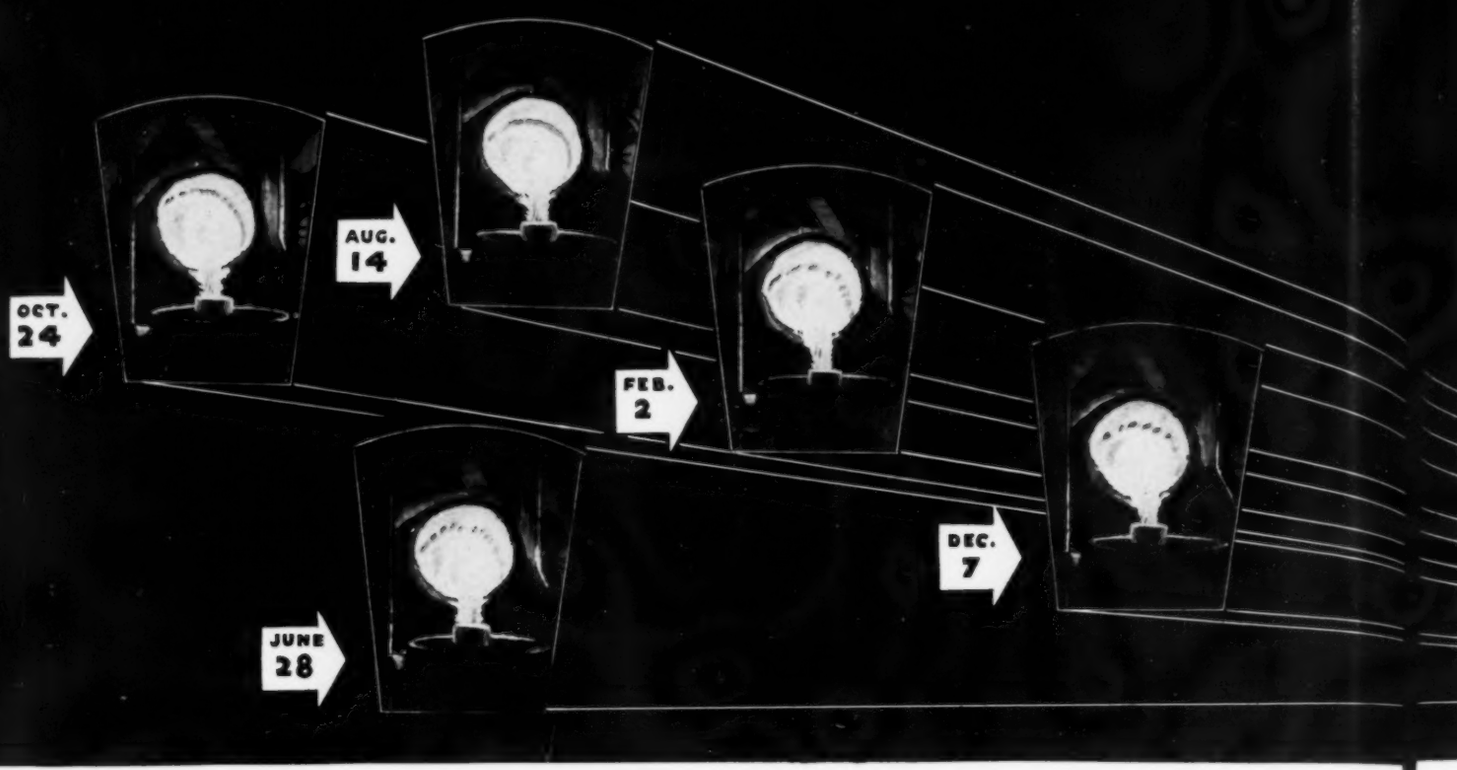


20-42 Type D Heavy Duty Jolt Squeeze Molding Machine with Pattern Drawing Device and equipped with automatic Flask Roll-Off Device—9" diameter jolt piston—20" squeeze piston.

WM. H. NICHOLLS CO., Inc.

RICHMOND HILL · LONG ISLAND · NEW YORK

Foreign Manufacturers and Selling Agents—
For Continental Europe and Great Britain—The George Fischer Steel and Iron Works, Schaffhausen, Switzerland



MONTH AFTER MONTH WITHIN 1/32"—

V-Foundry Alloys were developed several years ago to treat two of the knottiest problems of the foundry industry — control and reproducibility in gray cast iron.

How well V-Alloys serve this purpose is being demonstrated in an ever-increasing number of foundries. The reports show, for example, that in V-Alloy-treated gray iron castings of the same composition, the variation in chill depth from cast to cast is only 1/32" to 2/32".

Reproducibility is apparently just as reliable at one time of the year as another. In all conditions of weather and moisture, in spite of variations in coke, pig iron, and scrap, if composition is the same, report after report shows no change in the narrow range of physical properties.

Tensile strength of most irons is slightly improved by V-Alloys. More important, the variation is always much less than in untreated irons and specifications are more easily met.

Brinell hardness is commonly controllable within 20-25 points. Due to the greater uniformity of hardness and elimination of hard spots, machinability is at least as good or, in many cases, is improved despite the increase in tensile strength.

V A N A

CORPORATION OF AMERICA • NEW YORK, N. Y.

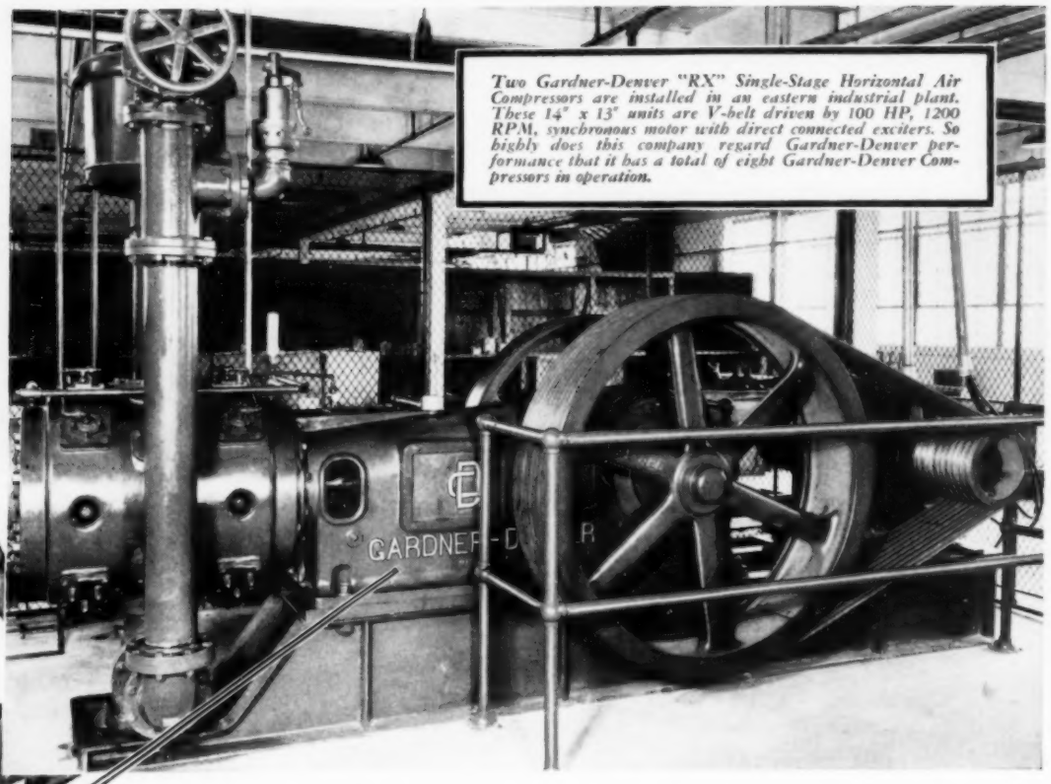
Although tensile strength is only a part of the story, many manufacturers have found V-Alloy practice extremely efficient for taking irons from the "30" classification to the "40" classification, achieving a remarkable improvement in machinability, and getting the result at a very small increase in cost.

A further advantage is that the effect of any reasonable excess of V-Alloy is solely beneficial. After the minimum necessary for reaction purposes has brought the iron to the proper state of equilibrium, excess additions over a considerable range do not disturb this balance, but effect a true alloy-improvement in physical properties.

Two alloys — V-5 and V-7 — are available, the best one to use depending on the particular situation. Upon request, our metallurgical staff, fully acquainted with this entire development, will be glad to assist in selection and any applications of these alloys.

VANADIUM

FERRO ALLOYS

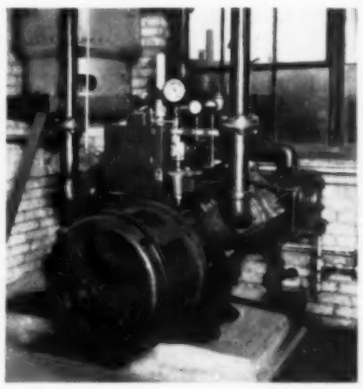


Two Gardner-Denver "RX" Single-Stage Horizontal Air Compressors are installed in an eastern industrial plant. These 14" x 13" units are V-belt driven by 100 HP, 1200 RPM, synchronous motor with direct connected exciters. So highly does this company regard Gardner-Denver performance that it has a total of eight Gardner-Denver Compressors in operation.

"THIS COMPRESSOR SAVES US MONEY IN SAND BLASTING AND GRINDING"

Lower-cost operation of air-actuated equipment! That's the "bonus" this eastern industrial plant gets every working day, with its Gardner-Denver "RX" Single-Stage Horizontal Compressors. Here are the special "RX" advantages that make such savings possible:

1. **Economical operation because of unusually low horsepower requirements.**
2. **Increased efficiency due to large and unrestricted valve and port areas and extra large water jackets.**
3. **Long service assured by rugged, dirt-free construction.**
4. **Duomatic Control that automatically regulates air output to air needs.**
5. **Capacities from 89 to 1292 cubic feet displacement per minute.**
6. **May be equipped for any type of drive.**



Gardner-Denver "WB" Vertical, Two-Stage, Water-Cooled Compressor, a smaller machine with efficiencies comparable to large horizontal compressors. Capacities from 142 to 445 cubic feet per minute.

GET THE FACTS on Gardner-Denver "RX" and "WB" Compressors for lower-cost foundry operation. Write today to Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER *Since 1859*

8 MORE-

SWINDELL

TOP-CHARGE — SWINGING ROOF

ELECTRIC MELTING FURNACES

WITH OVER 100-TON TOTAL CAPACITY

INCREASE TO 23 THE NUMBER OF SWINDELL ELECTRIC MELTING FURNACES PRODUCING DEFENSE STEEL IN ONE LARGE MIDWEST AUTOMOTIVE FOUNDRY

WHAT ARE *your* REQUIREMENTS?

SWINDELL • DRESSLER *Corporation*

DESIGNERS AND BUILDERS OF MODERN FURNACE EQUIPMENT SINCE 1850

PITTSBURGH, PA.

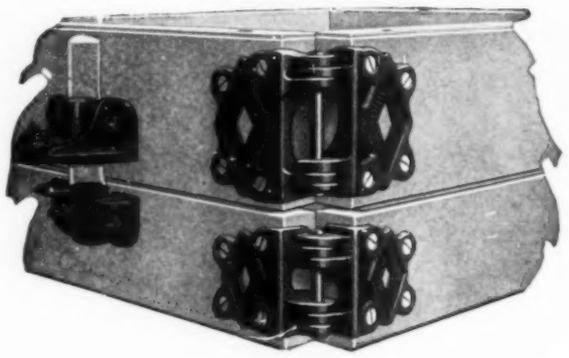
A *Real* INVESTMENT FOR MORE PRODUCTION!

DIAMOND FLASKS

No matter what happens—you'll never be wrong if you equip for production with *good* flasks. Because we can give you many exclusive features in a flask developed over a period of 50 years, it can also be said that, "You can't go wrong on a Diamond," either. Note these important features:

- **A SUPERIOR LATCH** (exclusive)

  It's self-compensating for wear. The tighter you draw it, the firmer the grip. Has special cam which is easily adjustable as extreme wear on parts develops. Only *Diamond* has this patented feature.



- **PRECISION-MADE**

  Made from the finest grade of well-seasoned cherry stock, all flasks are made to precise measurements according to your specifications.

- **A PATENTED HINGE** (exclusive)

  Note the construction of Diamond hinges. The lugs are carefully milled and are interlocking which eliminates "play" no matter how long or how hard the flask is used.

- **SPECIAL SHAPES**

  We regularly supply customers with special shape flasks, including round flasks, and special cut partings.

STEEL JACKETS

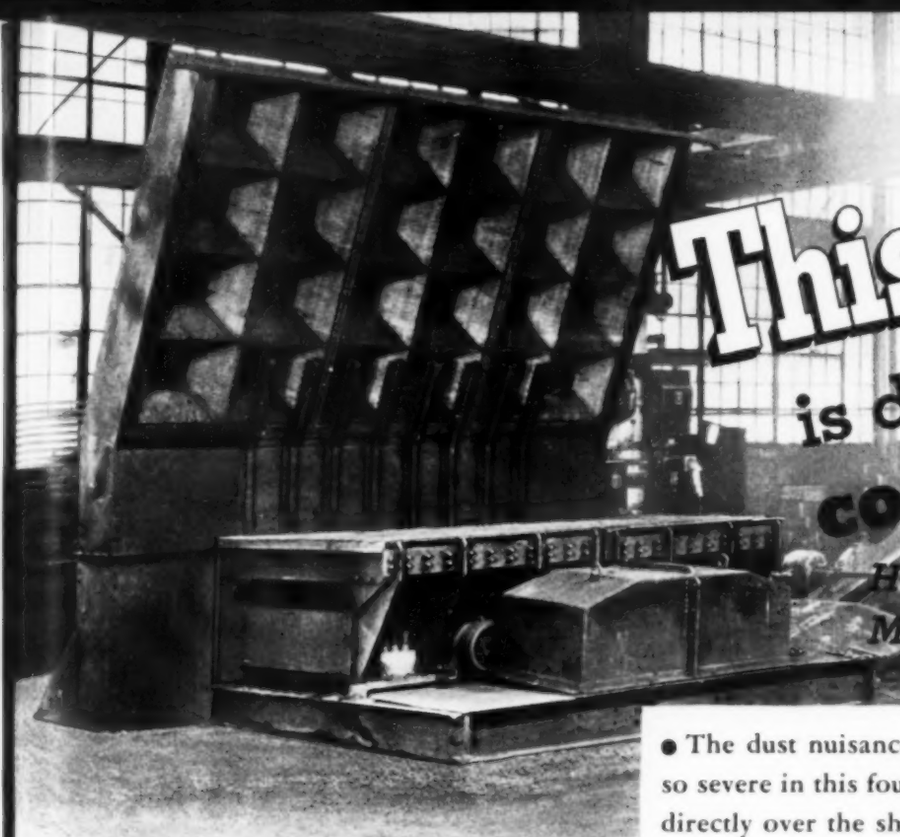
Made from Nos. 7 to 10 gauge steel, true to size and taper. Are practically indestructible, and retain their shape under severest conditions. Thousands of these jackets in use.

DIAMOND

CLAMP AND FLASK COMPANY

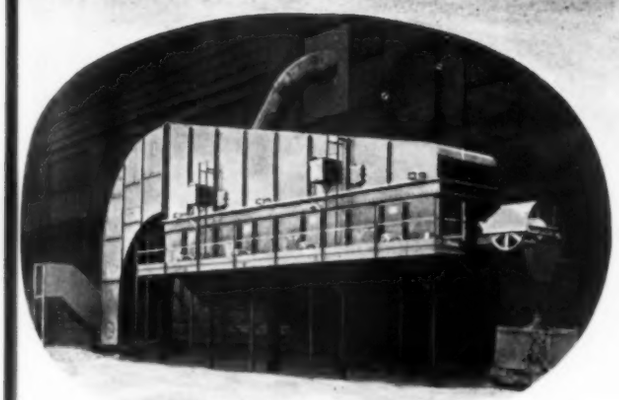
Telephone 2553 **Richmond, Indiana**

Designers of* CORE PLATES, JACKETS, BANDS, FLASKS *since 1889



This dust hood is doing "a job that couldn't be done"

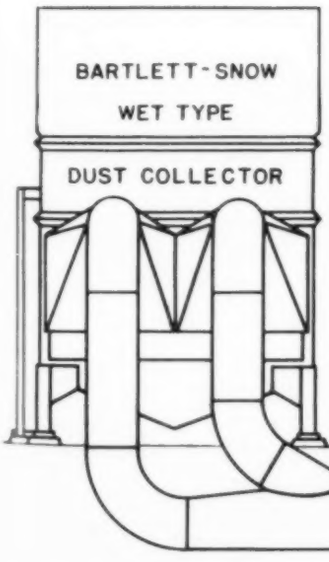
Handles 33,000 Cu. Ft. of Air a Minute to Clean Up an Exceedingly Severe Dust Nuisance



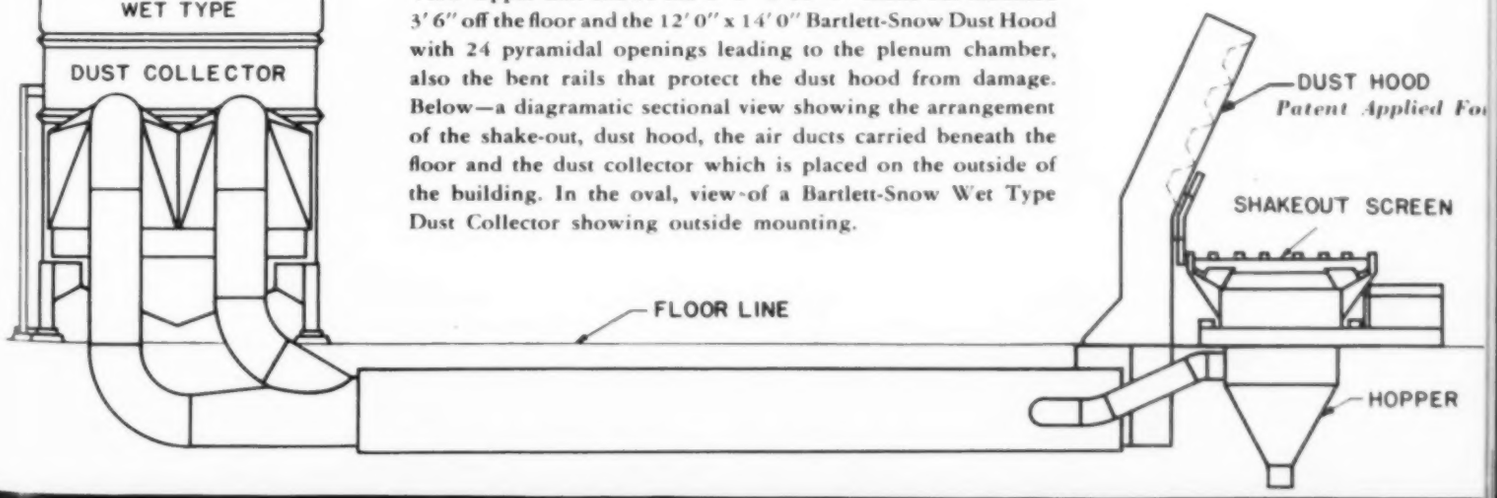
● The dust nuisance resulting from shaking out dry sand molds was so severe in this foundry that the crane operator, who was of necessity directly over the shake-out, had to use a gas mask. It was impossible to see even 10 ft. in any direction when a flask was being shaken out. After other remedies had failed a Bartlett-Snow Side Wall Dust Hood 12′ long by 14′ high, having 24 pyramidal openings into a plenum chamber, and connected to a Bartlett-Snow Wet Type Dust Collector was installed. With this equipment it is possible to shake out flasks 7′ long, 3′ wide and 3′ high on the most distant edge of the shake-out without any visible dust loss whatever, and even to handle flasks 17′ long, 5′ wide and 3′ high with only slight traces of dust loss even though these flasks are 7′ longer than the shake-out itself. We solicit your inquiries. More complete details will be furnished on request.

THE C. O. BARTLETT & SNOW COMPANY

30 Church Street, NEW YORK — 6201 Harvard Avenue, CLEVELAND — First Natl. Bank Bldg., CHICAGO



View Upper Left shows the 8′ 0″ x 10′ 0″ shake-out mounted 3′ 6″ off the floor and the 12′ 0″ x 14′ 0″ Bartlett-Snow Dust Hood with 24 pyramidal openings leading to the plenum chamber, also the bent rails that protect the dust hood from damage. Below—a diagramatic sectional view showing the arrangement of the shake-out, dust hood, the air ducts carried beneath the floor and the dust collector which is placed on the outside of the building. In the oval, view of a Bartlett-Snow Wet Type Dust Collector showing outside mounting.



BARTLETT-SNOW

ENGINEERS, DESIGNERS AND FABRICATORS FOR THE FOUNDRY INDUSTRY

Complete Structural, Machine and Plate Fabricating Facilities to Meet Any Requirement

All-Out Defense

Demands "Better Methods" for the Foundry

B&P Equipment Speeds Production

Speedslingers save from $75.00 to $100.00 daily on average jobbing work and make twice as many molds per day over former methods where the ramming operation is an important factor. The number of gaggers used in one mold was reduced from 118 to 15, demonstrating the accuracy and uniformity of *Speedslinger* ramming. Time formerly required to set the 118 gaggers was greater than the ramming time.

The *Portable Sand Conditioner* is specially designed for conditioning facing and backing sand in jobbing foundries where an elaborate sand system is not warranted and crane service is available. This low cost, portable sand conditioning unit meets a need that has long existed in the jobbing foundry.

The *Screenarator* cuts, screens, double aerates, blends and piles backing, facing and core sand—sand that is open, fluffy, clean and thoroughly conditioned. Plugs into any available outlet wherever desired on the foundry floor. Easily moved to any position in the shop by one man. Rubber-tired wheels roll easily over the roughest floors. Three models: capacities from 1000 to 2000 pounds per minute.

Gyratory Screen: The gyratory action of this modern sand screen provides a most complete and thorough screening action, greater capacity from less screen area, rapid distribution of sand without clogging, plus a lump breaking action. This modern sand screening device is fast, efficient and economical on sand of any weight, size, bond or moisture content.

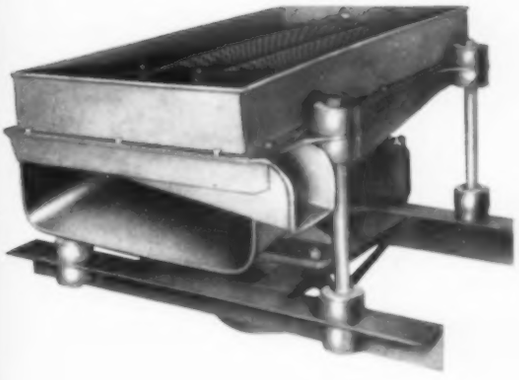
Speedmullor: The only foundry sand preparation equipment that not only mulls sand, but thoroughly mulls and continuously aerates while the sand is in suspension around the side walls of the mullor. The mulling and aerating take place between two pieces of rubber, namely, the rubber lined wall and rubber tire (which does not crush silica grain), squeezing the sand one grain against the other and turning it over 200 times a minute. At slight additional cost air can be blown through the sand to cool it from high temperatures down to within 5 degrees of room temperature; fines can be removed if desired; and, warm air may be introduced to the fan to quickly thaw out frozen sand, and dry out wet sand. The *Speedmullor* can be further equipped with a heating unit to heat up core sand so as to get a better distribution of the oil and then cool it to room temperature before discharging.

These things have never been accomplished before with a single piece of equipment and within so little floor space. Sand was never before put in as good condition with as accurate control.

B&P

PORTABLE SAND CONDITIONER

SCREENARATOR



GYRATORY SCREEN

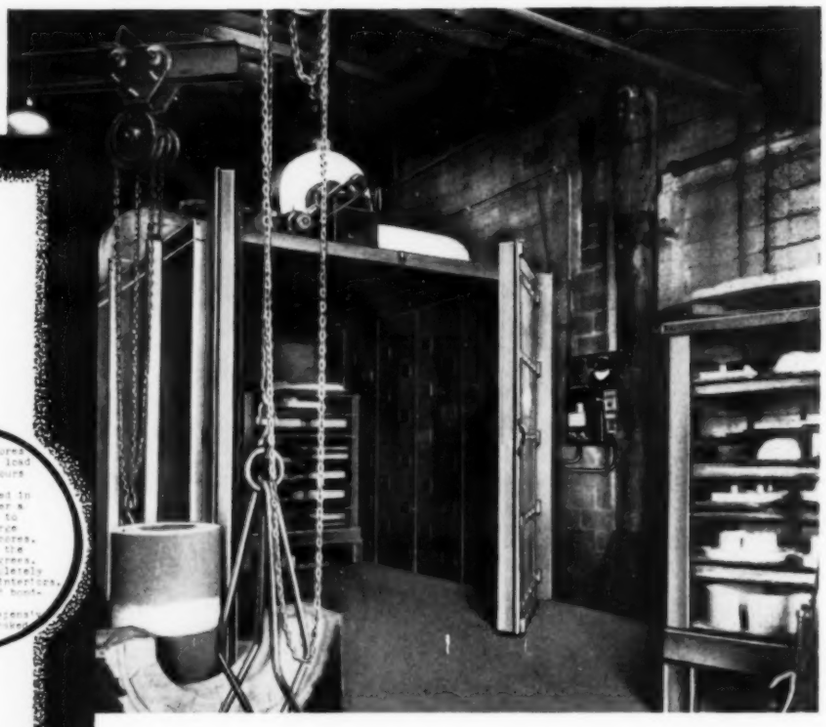
SPEEDMULLOR

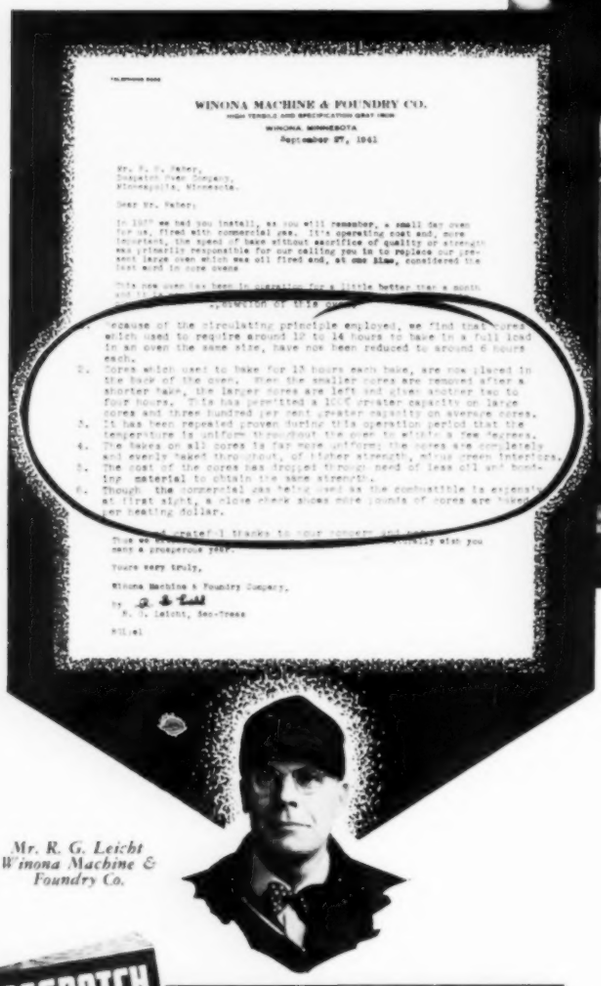
THE BEARDSLEY & PIPER COMPANY

2541 NORTH KEELER AVENUE
CHICAGO

WHAT AN OLD DESPATCH CUSTOMER DISCOVERED IN THE NEW . . . . . .

DESPATCH CORE BAKING OVENS





WINONA MACHINE & FOUNDRY CO.
HIGH TENSILE AND SPECIFICATION GRAY IRON
WINONA, MINNESOTA
September 8th, 1941

Mr. R. G. Leicht,
Despatch Oven Company,
Minneapolis, Minnesota.

Dear Mr. Leicht:

In 1937 we had you install, as you will remember, a small day oven for us, fired with commercial gas. It's operating cost and, more important, the speed of bake without sacrifice of quality or strength was primarily responsible for our calling you in to replace our present large oven which was oil fired and, at one time, considered the last word in core ovens.

This new oven has been in operation for a little better than a month and [illegible] production of this oven

1. Because of the circulating principle employed, we find that cores which used to require around 12 to 14 hours to have in a full load in an oven the same size, have now been reduced to around 6 hours each.
2. Cores which used to bake for 15 hours each bake, are now placed in the back of the oven. When the smaller cores are removed after a shorter bake, the larger cores are left and given another two to four hours. This has permitted a 100% greater capacity on large cores and three hundred per cent greater capacity on average cores.
3. It has been repeated proven during this operation period that the temperature is uniform throughout the oven to within a few degrees.
4. The bakes on all cores is far more uniform; the cores are completely and evenly baked throughout, of higher strength, minus green interiors.
5. The cost of the cores has dropped through need of less oil and binding material to obtain the same strength.
6. Though the commercial gas we're using as the combustible is expensive at first sight, a close check shows more pounds of cores are baked per heating dollar.

This and grateful thanks to your support and [illegible] anything else you want a prosperous year.

Yours very truly,

Winona Machine & Foundry Company,

By R. G. Leicht, Sec-Treas

RGL:el

Mr. R. G. Leicht
Winona Machine & Foundry Co.

Write for Bulletin No. 31 for the details of the Despatch Core Oven with photos of recent installations and information about types of core handling.

What a success story this letter tells. A close check for one month by Winona Machine & Foundry Company shows that the new Despatch oven increased core output up to 300% . . . baked every core thoroughly . . . baked both large and small cores at the same time . . . reduced fuel costs . . . saved core binder.

This is typical of the success of the Despatch principle of horizontal flow heating system for all types and sizes of core baking ovens for foundries all over the country. It has been applied successfully to Despatch continuous conveyor ovens both tower type and elevated type, to Despatch monorail loaded ovens as well as Despatch batch type. The success in so many production tests warrants the attention of every foundry oven buyer.

DESPATCH OVEN COMPANY MINNEAPOLIS, MINNESOTA

When, early in October, 1940, St. Paul's was bombed, the roof was pierced and the high altar destroyed. The massive dome, however, escaped and still stands as a landmark, not only geographically, but of the spirit of a people.

★ ★ ★

The present St. Paul's Cathedral, London, is in effect the fourth of the name to rise on its site, which is the highest ground in the city. The third church was partially burned in the Great Fire of London in 1666. After a partial restoration, Sir Christopher Wren, the famous architect, with an able, seasoned crew of artisans, erected a virtually new building. The first stone was laid on June 21, 1675, and the last in 1710. That meant 35 years of minute, yet large-scale planning. The cost of this, the only non-Gothic edifice of its class in England, would be around $25,000,000 today. The "imperial cathedral of the British nation" is noted for its whispering gallery in the dome, its tombs of the Iron Duke and Admiral Lord Nelson, a bust of our own George Washington, and the finest peal of bells in the world.

The SPO personnel has served your industry for many years. SPO Molding Machines have carried forward and expressed in terms of equipment a specialized experience in your field. "SPO" stands essentially for *craftsmanship*—for painstaking design and steady improvement.

SPO

INCORPORATED.

Manufacturers and Specialists in Molding Machines, Vibrators and Patterns for Production

7500 GRAND DIVISION AVENUE • • CLEVELAND, OHIO

MACKLIN
GRINDING WHEELS

Macklin Wheels Are Uniform

Uniformity in grinding wheels must begin with the first manufacturing operation. Extra precautions are taken to insure absolute accuracy in mixing the specified abrasives and bonds to pre-determined standards and formulas. Ingredients are carefully weighed to exact proportions in air conditioned and humidity controlled departments. These modern methods enable Macklin to *Protect Your Production* by producing uniform and scientifically controlled grinding wheels.

Ask for Macklin Engineering Service

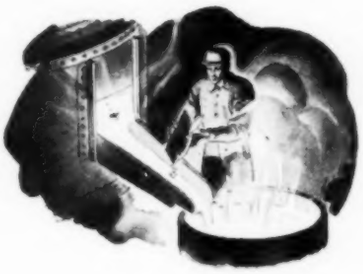
MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

Improve your Iron with ladle additions of "SMZ" ALLOY



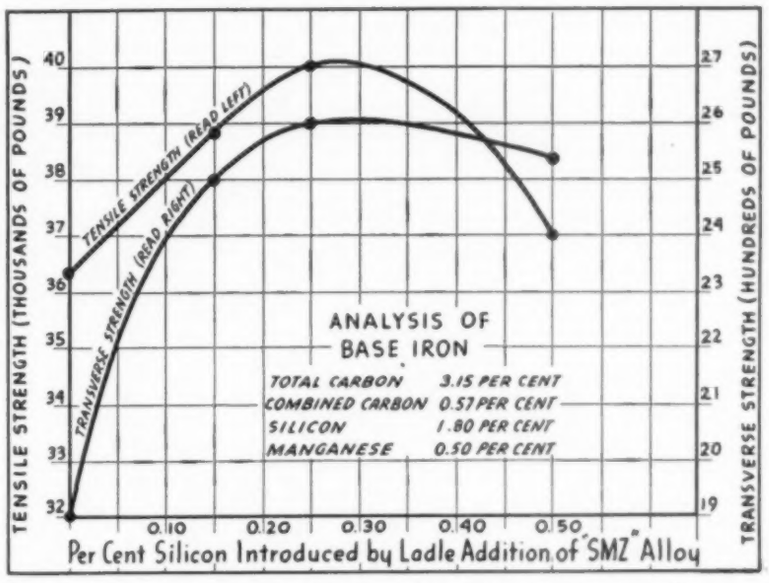
BY adding small amounts of "SMZ" alloy to cast iron in the ladle, you can get a stronger, tougher iron of better machinability. This balanced alloy of silicon, manganese, and zirconium improves the structure of cast iron, thus improving its physical properties. It also lowers the depth of chill of cast iron, thus softening the iron at corners and in light sections and making it more machinable. The graphs at the right show how "SMZ" alloy raised the tensile strength, the transverse strength, and the deflection, and decreased the depth of chill of the same base iron.

One of our metallurgists will gladly call at your request and tell you more about "SMZ" alloy and how it can improve *your* iron. He can tell you also about the many other "Electromet" ferro-alloys for the foundry and give you practical help in using them to obtain better iron, often at lower cost. This service is yours for the asking.

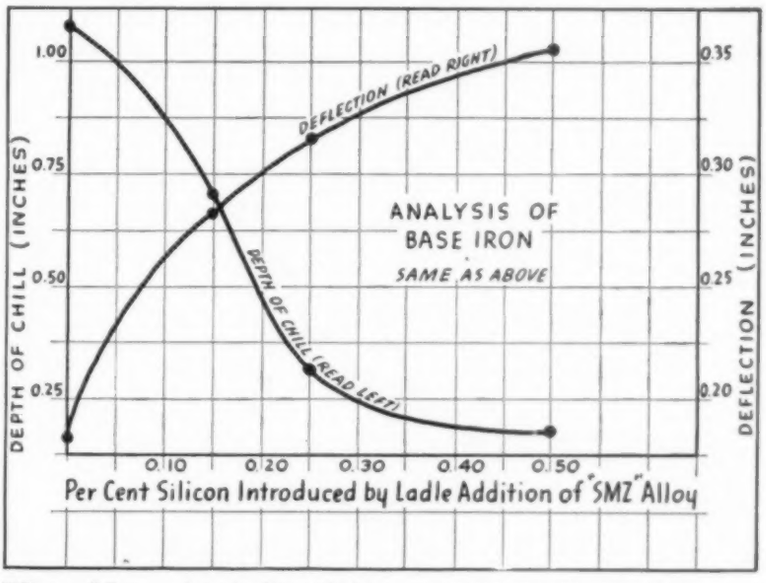
ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation

30 East 42nd Street, New York, N. Y.

The word "Electromet" and the letters "SMZ" are registered trade-marks of Electro Metallurgical Company.


TENSILE STRENGTH (THOUSANDS OF POUNDS)
TRANSVERSE STRENGTH (HUNDREDS OF POUNDS)
TENSILE STRENGTH (READ LEFT)
TRANSVERSE STRENGTH (READ RIGHT)
ANALYSIS OF BASE IRON
TOTAL CARBON 3.15 PER CENT
COMBINED CARBON 0.57 PER CENT
SILICON 1.80 PER CENT
MANGANESE 0.50 PER CENT
Per Cent Silicon Introduced by Ladle Addition of "SMZ" Alloy

Effect of Increasing Ladle Additions of "SMZ" Alloy on Tensile Strength and Transverse Strength of Cast Iron.

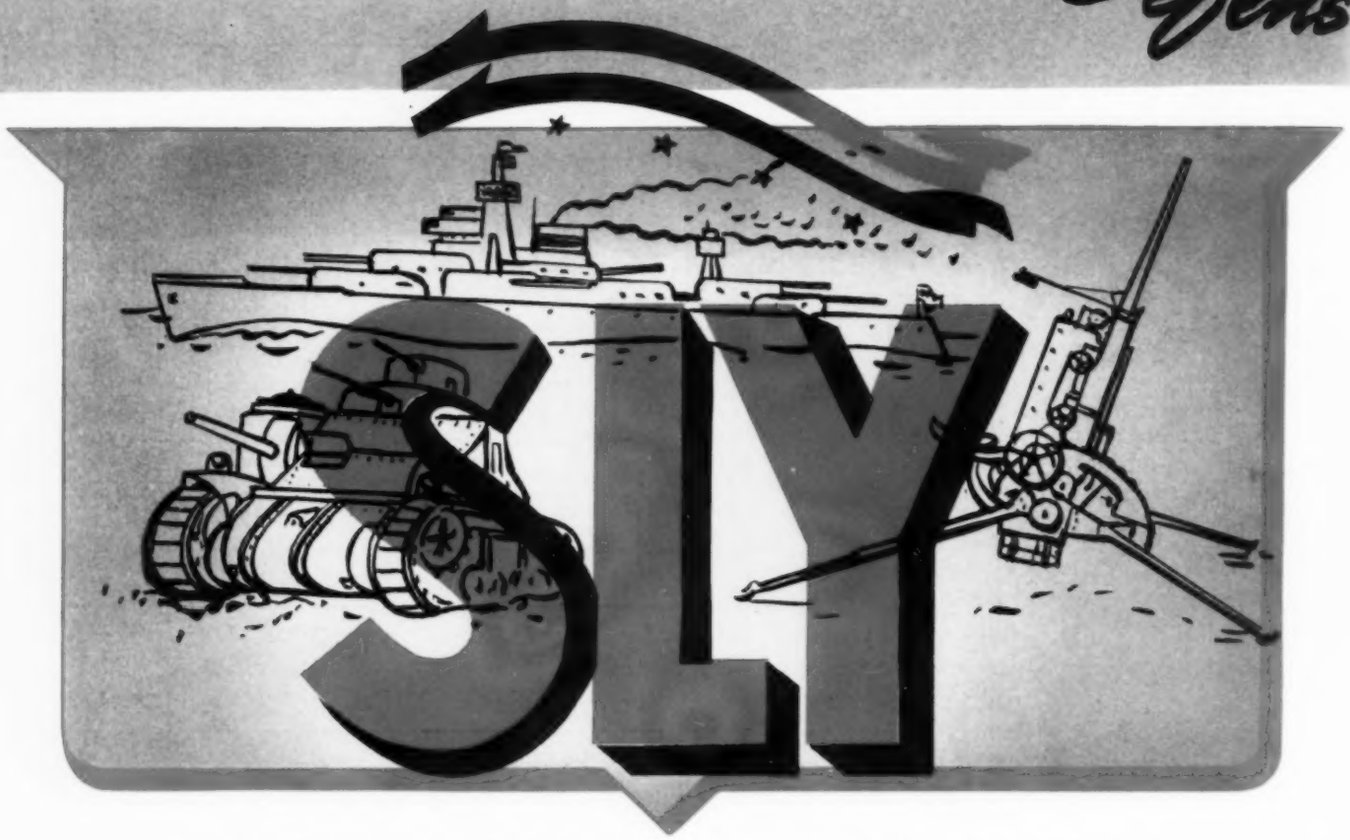

DEPTH OF CHILL (INCHES)
DEFLECTION (INCHES)
DEFLECTION (READ RIGHT)
DEPTH OF CHILL (READ LEFT)
ANALYSIS OF BASE IRON
SAME AS ABOVE
Per Cent Silicon Introduced by Ladle Addition of "SMZ" Alloy

Effect of Increasing Ladle Additions of "SMZ" Alloy on Deflection and Depth of Chill of Cast Iron.

Electromet
Trade-Mark
Ferro-Alloys & Metals

Available through offices of Electro Metallurgical Sales Corporation in Birmingham, Chicago, Cleveland, Detroit, New York, Pittsburgh, and San Francisco. In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

PLAYING A VITAL PART IN *National Defense*



FOUNDRY CLEANING EQUIPMENT
DUST CONTROL SYSTEMS

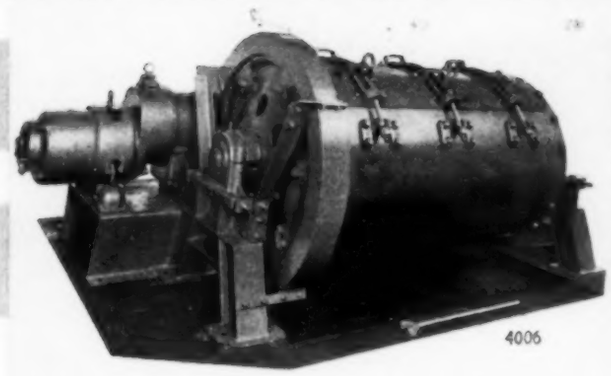
★ Sly is taking a prominent part in National Defense by supplying equipment used in the production of various kinds of armament:

Tumbling Mills, Blast Cabinets, Blast Rooms, Blast Mills and CENTRI-BLAST Airless Cleaning Equipment for handling all kinds of castings, forgings and other metal parts employed in the construction of tanks, gun mountings, tractors, trucks, ships, airplanes and other materiel; dust filters for controlling industrial dust hazards, guarding health of employees and maintaining quality of production.

We take pride in this role in National Defense as we do in our 68 years of service to the foundry industry—in the notable progress made in cleaning faster, better and at lower cost.

THE W. W. SLY MANUFACTURING CO.
4753 Train Avenue • Cleveland, Ohio

A COMPLETE LINE OF FOUNDRY CLEANING EQUIPMENT

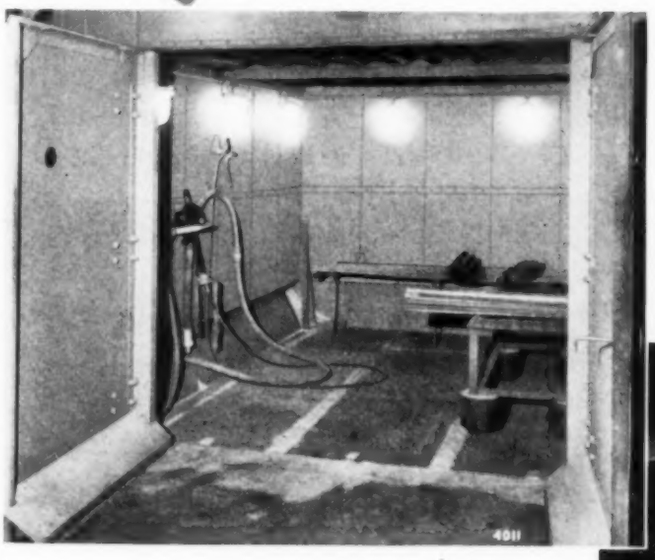


SLY TUMBLING MILLS

1. Heavy forged steel trunnions, extra heavy roller bearings.
2. Special door locks—easily operated.
3. Extra heavy gearhead motor.
4. Integral motor platform.
5. Sly design permits loading and unloading from either side.

SLY DUST FILTERS

1. More filter cloth—hence greater filtering capacity.
2. Filter bags under tension (patented) insure: (a) minimum resistance to air flow, and (b) complete dust removal.
3. Simpler shaker mechanism — less moving parts, less maintenance.
4. Bags more easily replaced.
5. Automatic control.

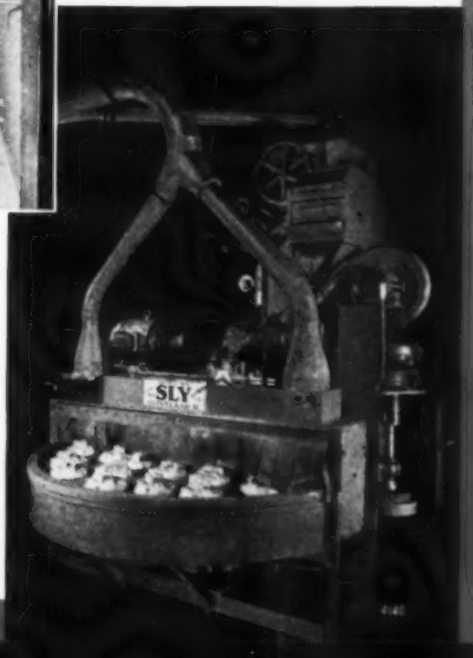


SLY CENTRI-BLAST

Airless Blast Mills and Tables

(Shown Below)

Exclusive wheel features for fast and economical cleaning.



SLY BLAST ROOMS

(Shown Above)

1. Down-draft ventilation through entire area of ceiling.
2. Ample illumination.
3. Lined throughout with 3/16" wear plates.
4. More sturdy and safe floor construction of grating and perforated plates.

★ ★ ★ ★

Some Recent Sly Installations

Aluminum Co.

Beech Aircraft Corp.

Bohn Aluminum & Brass

Budd Wheel Co.

Busch-Sulzer Bros. Diesel Engine Co.

Canadian Propellers Ltd.

Cessna Aircraft

Consolidated Aircraft

Curtiss-Wright Corp.
Airplane Division

de Haviland Aircraft

Douglas Aircraft

Electric Auto-Lite Co.

Electro Metallurgical Co.

Ford Motor Co.

General Steel Castings

R. G. LeTourneau, Inc.

Lockheed Aircraft Corp.

Glenn L. Martin

National Bronze & Aluminum Fdry. Co.

National Carbon Co.

National Mall. & Steel Castings

Newport News Shipbuilding & Dry Dock Co.

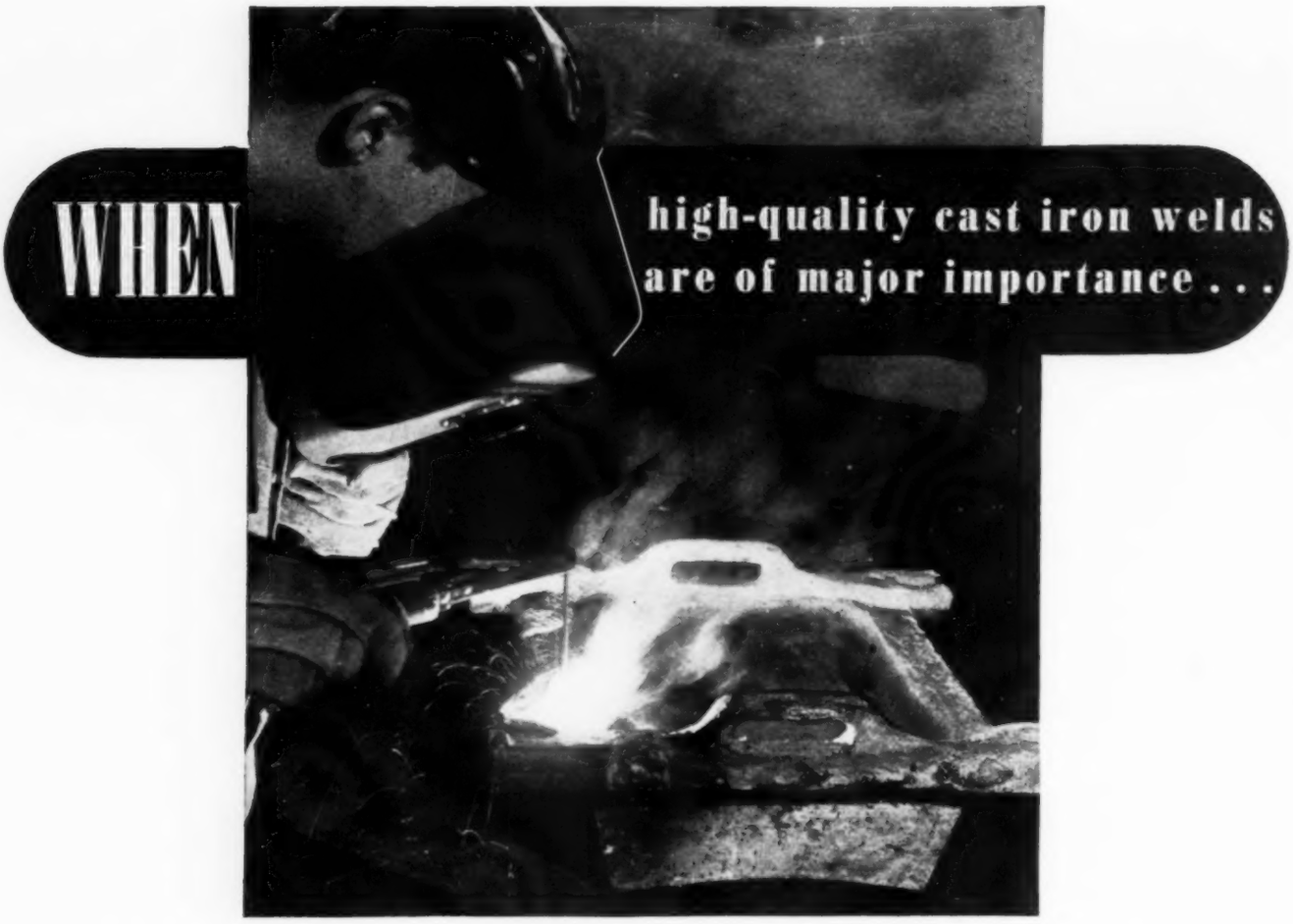
Rock Island Arsenal

Rohr Aircraft

Shawinigan Chemicals

Thompson Aircraft Products

Willys-Overland



Weld With AIRCO No. 95 Electrode

Any gray iron casting of normal analysis should be welded with Airco No. 95 Dipped Coat Electrode whenever a machinable surface is necessary or when it is desirable to retain the color, structure and expansive characteristics of the original casting. Operators prefer welding with Airco No. 95 because the deposited metal is unusually fluid, therefore, easier to work. The slag produced affords ample protection yet is light and can be easily removed.

Welds, when properly made with Airco No. 95, have a refined, close-grained structure with tensile strengths of 25,000 — 35,000 lbs. p.s.i. Their hardness averages 15 to 20 on the Rockwell C Scale, 87 to 97 on Rockwell B, and 250 to 275 Brinell — hard yet well within the machinable range. Such welds are considerably stronger than an ordinary casting. Air pressure of 100 lbs. and water pressure of 50 lbs., p.s.i. does not seep through the welds. Copy of the new leaflet on cast iron electrodes will be sent on request. Write any Airco office.

Air Reduction

General Offices: 60 EAST 42nd ST., NEW YORK, N. Y.

IN TEXAS
MAGNOLIA-AIRCO GAS PRODUCTS CO.
AIRCO DISTRICT OFFICES IN PRINCIPAL CITIES

AIRCO WILSON

Anything and Everything for GAS WELDING or CUTTING and ARC WELDING

Thanks a Lot...!

MILWAUKEE FOUNDRY EQUIPMENT CO.

MANUFACTURERS OF MOLDING MACHINES AND BRIQUETTING PRESSES

3238 WEST PIERCE ST. MILWAUKEE, WISCONSIN

CABLE ADDRESS MILMOLDCO

TELEPHONE MITCHELL 8630

December 1, 1941

Foundrymen
Everywhere
U.S.A.

Gentlemen:

Just 17 years ago this month, Mr. E. J. Byerlein founded the Milwaukee Foundry Equipment Company in a modest, one-room factory. He started with a small Plain Squeezer. The following year, Jolt Squeezing Strippers were added to the line and we became the sales agent for the complete Davenport Line.

Through Mr. Byerlein's efforts, new, improved models were added from time to time, and an organization was built up of practical foundrymen, all imbued with his traditions to build the very best molding machines possible.

As a result, the company has grown by leaps and bounds. In 1928 a large plant was erected and this year we have more than doubled our facilities.

Today, we take pleasure in announcing that after January first the Davenport Line will be replaced by modern machines of our own make which have proven to be very efficient in operation during the past two years.

For your part in helping us develop this most complete line of modern molding machines, we say "Thanks a Lot." It was only through your cooperation and patronage that this unusual growth was made possible.

May we also take this opportunity to wish you a Merry Christmas and a most successful 1942.

Sincerely yours,

MILWAUKEE FOUNDRY EQUIPMENT CO.

H. E. Fellows

H. E. Fellows
General Manager

H.E. Fellows/S

MILWAUKEE FOUNDRY EQUIPMENT CO.

3238 WEST PIERCE STREET • Cable Address "MILMOLDCO" • MILWAUKEE, WISCONSIN

The pull is

Cleveland Public Auditorium where 1942 A.F.A. Convention and Exhibition will be held.

LOCATED in the center of the foundry industry of the world, Cleveland again in 1942 is honored with the role of "host" to the thousands of foundrymen who will attend the forty-sixth annual convention of the American Foundrymens Association.

It is already apparent that a great exhibit is assured. Visitors to the 1942 foundry convention will see the greatest display of modern foundry equipment, supplies and accessories ever to be assembled under one roof. And in addition there will be educational and instructive exhibits by the U. S. Army Ordnance Association—Tanks, Guns, Transports etc., with a special display of the important part cast metals are taking in our National Defense. Engineering and Trade Schools are also co-operating with extensive exhibits.

Technical Sessions featuring discussions of present day castings production methods together with a well planned entertainment schedule will round out an outstanding program to make *this* convention a most profitable and long-to-be-remembered event.

Put the dates on your calendar now and be in Cleveland April 18th to 24th, 1942—"The Pull is Toward Cleveland"!

46th

ANNUAL A. F. A.

Toward Cleveland

IN 1942

THE FOUNDRY

Presents

FOR APRIL

THE PRE-CONVENTION ISSUE

. . . pre-viewing this great convention—new and improved equipment to be displayed—new processes in material handling—new methods in foundry practice to be discussed—a complete program of the entire six days . . . technical sessions . . . plant visitation . . . social and entertainment plans . . . places to see . . . things to do . . . all this *in addition* to the many worthwhile editorial features and valuable and pertinent information of interest to *all* foundrymen found in every issue of The Foundry.

Advertising forms close March 6.

FOR MAY

THE POST-CONVENTION ISSUE

. . . a printed record of what actually took place at the convention . . . reports of technical sessions . . . the exhibition . . . who was there . . . what they said and did . . . in fact the May Post-Convention issue of The Foundry could well be indexed as a reference volume and made a valuable addition to your foundry library.

For those thousands of foundrymen who can attend the convention, the May issue of The Foundry will serve as a diary of the profitable and pleasant contacts with fellow foundrymen during the days in Cleveland. For those who cannot attend, this important issue of The Foundry *will be the convention itself!* For *all* it will preserve this Convention in word and picture.

Advertising forms close April 6.

NOTE: *To all manufacturers and suppliers who in any way contact, sell and serve the foundry industry, these two issues of The Foundry present an invaluable advertising opportunity at a time when the eyes of the entire foundry industry will be focused on the Cleveland convention.*

CONVENTION APRIL 18-24, 1942

From small precision work to rough snagging jobs

it's PRODUCTION Plus

with BAY STATE PRODUCTS

Cup Wheels • Straight Wheels
Cut-Off Wheels • Mounted Wheels • Cone Wheels

It pays to equip your machines with only the very highest quality grinding tools. For those thousand and one snagging and cut-off jobs BAY STATE products are unsurpassed. Don't take our word for this. Try us and be convinced!

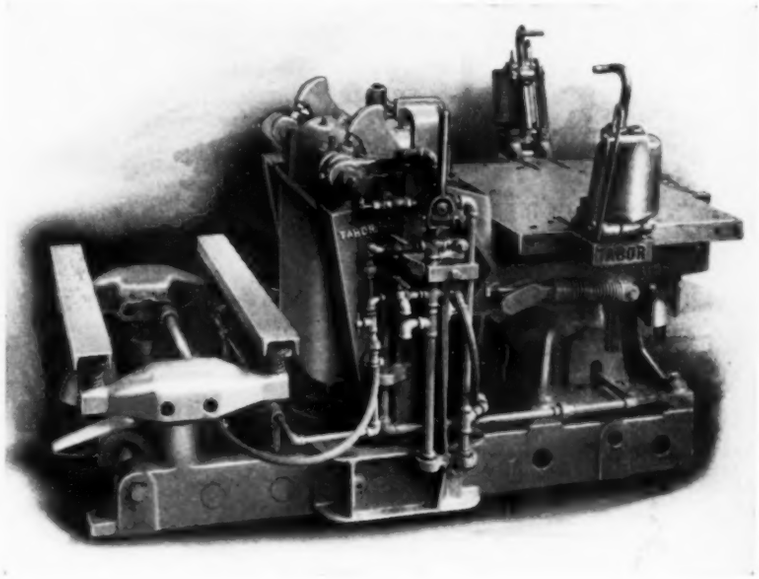
Bay State Abrasive Products Co.
WESTBORO, MASSACHUSETTS

...MEET YOUR PRODUCTION SCHEDULES WITH...

TABOR MOLDING MACHINES

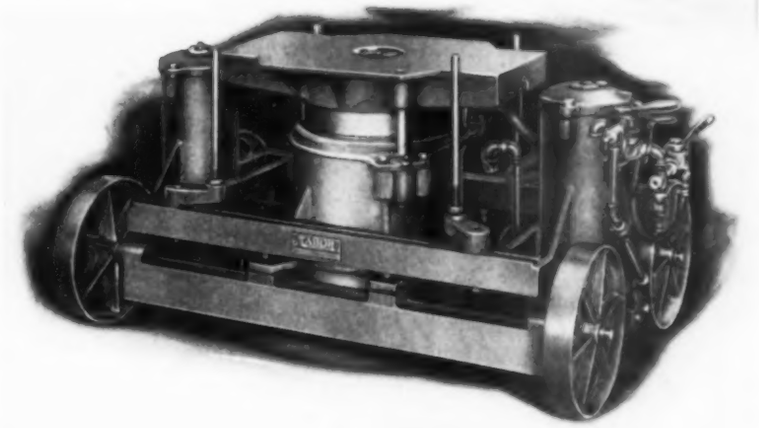
Tabor Foundry Equipment is ready to do—and is doing—its part in stepping up the production pace for foundries in the all-important defense program. In addition to a complete line of Foundry molding machines, Tabor manufactures and sells a full range of Foundry equipment. This includes the Tabor-Brasive cut-off machines which are particularly applicable to the defense needs of non-ferrous foundries.

JAR ROLLOVER PATTERN DRAW MACHINES



• Above: Tabor jarring member reduces ramming time to a minimum; air-on-oil rollover insures maximum speed with absolute safety; leveling device positively locked by air after automatic leveling. Handles any load from minimum to maximum with no danger of shift; air-on-oil draw, smooth at any desired speed, accurate throughout life of machine.

• Right: Tabor jarring member reduces ramming time to a minimum; oil controlled, slow start draw, speeds up when pattern clears the sand; lift pins, set in slots, swing out and in to accommodate a wide range of flask sizes.



JAR FLASK-LIFT MACHINES with adjustable flask-lift pins

TABOR
TRADE 1884 MARK

MANUFACTURING COMPANY
6225 Tacony Street, Philadelphia, Pa.

for NATIONAL DEFENSE

2 HOURS AND 40 MINUTES SAVED BETWEEN SHAKEOUT AND MACHINE SHOP

Hydro-Blast **at Minster Machine Co., completely surface cleaned, decored, and removed rods and gaggers from this casting in 20 minutes—without creating dust. The casting was removed directly from the shakeout to the *Hydro-Blast* cleaning room without preliminary sand chipping. Do you know of any other casting cleaning equipment that could perform this work in 20 minutes—a cleaning job that formerly required 3 hours?**

BEFORE HYDRO-BLASTING

HYDRO-BLAST Speeds Defense Production

Hydro-Blast is doing its part in many foundries where production is vital to our National Defense. It is rendering "all out" service in the manufacture of guns, gun turrets, gun mounts, aeroplane castings, machine tools, marine Diesels and steam engines, railroad castings and many other essential products. Wherever *Hydro-Blast* is installed it is keeping pace with every production demand. Your casting cleaning problems and a great many other expensive operations can be eliminated with *Hydro-Blast*. Users report phenomenal savings. Usually the investment is returned during the first year of operation.

HYDRO-BLAST also recovered, washed and classified the core sand for re-use.

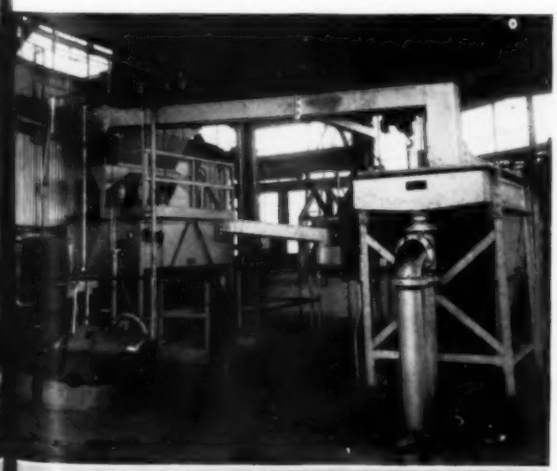
Sand control is the most direct approach to tr to-pattern castings, elimination of overweight, a vastly lowered scrap losses. *Hydro-Blast* may the answer to your sand control problems. Wr today for complete data.

20 Minutes With Hydro-Blast or 3 Hours Without

AFTER 20 MINUTES OF HYDRO-BLASTING

HYDRO-BLAST CLEANS ALL METAL CASTINGS

Hydro-Blast **cleaning is not limited. It is equally effective on a 50 pound or 50 ton casting—on steel, gray iron, magnesium or any other metal. Each** ***Hydro-Blast*** **installation is "tailored" to fit any unusual conditions in the shop — steel, gray iron, malleable, non-ferrous; production or jobbing; large or small work.** ***Hydro-Blast*** **users report phenomenal savings over other cleaning processes.**



Hydro-Blast **did far more than clean, decore and rod out this casting in 20 minutes. It also recovered, washed and classified the sand for re-use. These unretouched photographs illustrate the effectiveness of** ***Hydro-Blast*** **cleaning and the simplicity of** ***Hydro-Blast*** **sand recovery. The sand from the** ***Hydro-Blasted*** **casting washes down through the floor, then through a grading and refining process which removes all fines, dead bond, non-magnetic iron oxides and organic matter. Then it is washed, classified, dried and returned to the molding floor in better than new condition—at startlingly low cost per ton.**

The **HYDRO-BLAST** *Corporation*

Dustless Core Removal · Surface Cleaning · Sand Recovery

3118 CLYBOURN AVENUE • CHICAGO, ILLINOIS

erase a few wrinkles

What more appropriate gift for those time-driven, work-wearied defense customers of yours than news—good news, of speeded up shipments of vital castings, with improved quality and fewer rejects? Erase a few worries!

How to do it? Check the performance of your molding department as one step in the production speed-up of your own plant. Will an increased mold production of 300% to 400% materially improve the final delivery of your castings? It should.

Learn how hundreds of foundries here and abroad have made tremendous strides in the science of improved mold production with the aid of the latest Herman Molding Machines and improved molding department layout. You will not only benefit by increased speed in production but you will also effect new economies, increased profits, improved mold excellence and casting quality.

Erase a few customer wrinkles! Replace them with smiles. Get all the facts. Invite an experienced Herman foundry engineer to give you all the details. It will not obligate you.

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

Defense starts with a good casting!

Good castings demand correctly conditioned sand. Correct sand conditioning means 6 point preparation. 6 point preparation can only be secured with a Royer.

The Royer "combing belt" method of sand conditioning gives you

- ✓ Thorough refuse removal
- ✓ Positive lump breaking
- ✓ Complete blending and mixing
- ✓ Even moisture distribution
- ✓ Increased permeability
- ✓ Double aeration

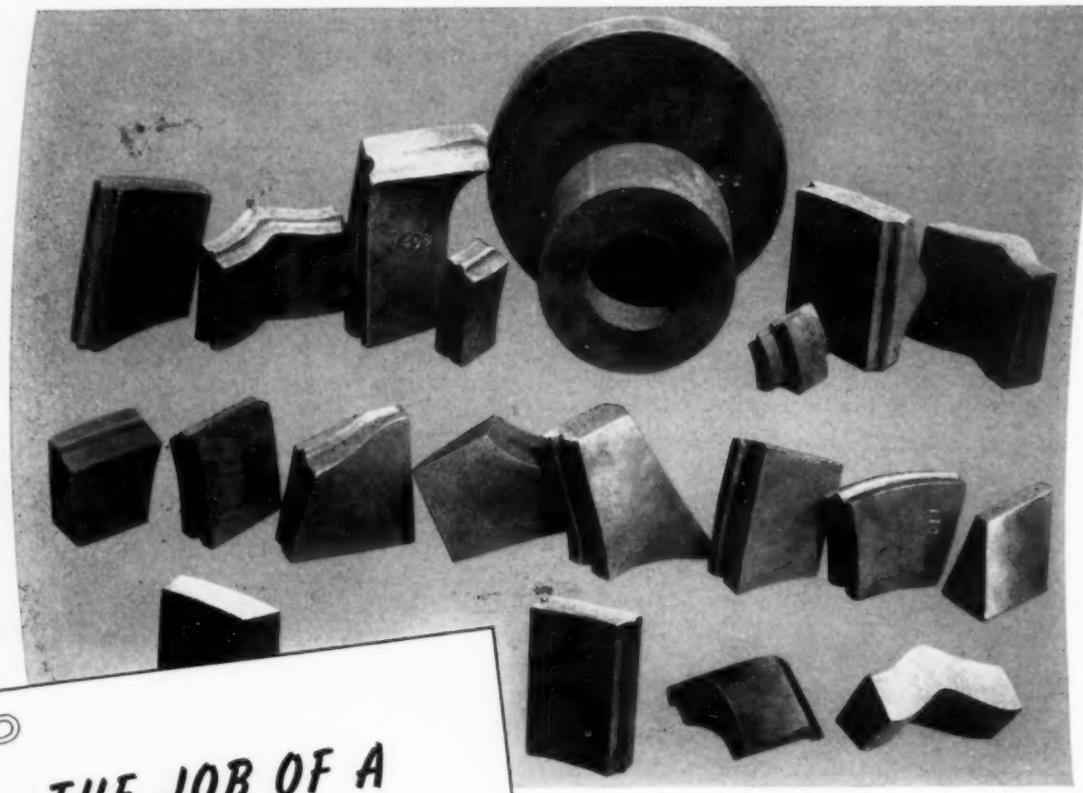
Royers are made in six portable models, three stationary models, two combination scrap remover models!

A type and size for every foundry, large or small, nonferrous, gray iron, malleable or steel. Thousands of users can't be wrong. Over 3,500 in use today making good castings for national defense.

Wire for details — many models shipped from stock.

THE ROYER

ROYER FOUNDRY & MACHINE CO. KINGSTON, PA



THE JOB OF A THOUSAND SHAPES

● There is an interesting story back of this job of a thousand shapes—a story that well illustrates the resourcefulness of Carborundum Refractory Engineering Service and the completeness of Carborundum Manufacturing Facilities.

The job was to provide a refractory lining to be used in a metallurgical process—a lining that would withstand molten metal, rapidly fluctuating pressures—at relatively high temperatures.

The specifications called for the building of a lining of highly complicated shapes of "Carbofrax", the Carborundum Brand Silicon Carbide Super Refractory. These shapes had to be designed to fit into a complicated shell, every unit keyed to fit and the whole to be mechanically stable.

It was a lot like a jig saw puzzle—except to our engineers. They studied the job, designed the parts, specified the right refractory material—a combination of application, design and manufacture—with the result that the lining for the shell, which holds eleven tons of metal, has set up an amazing record of performance.

A job that called for about a thousand different keyed fitted shapes!—many thousand pieces in all. Once again it was a case of a client asking "What can you do for us"—and we produced!

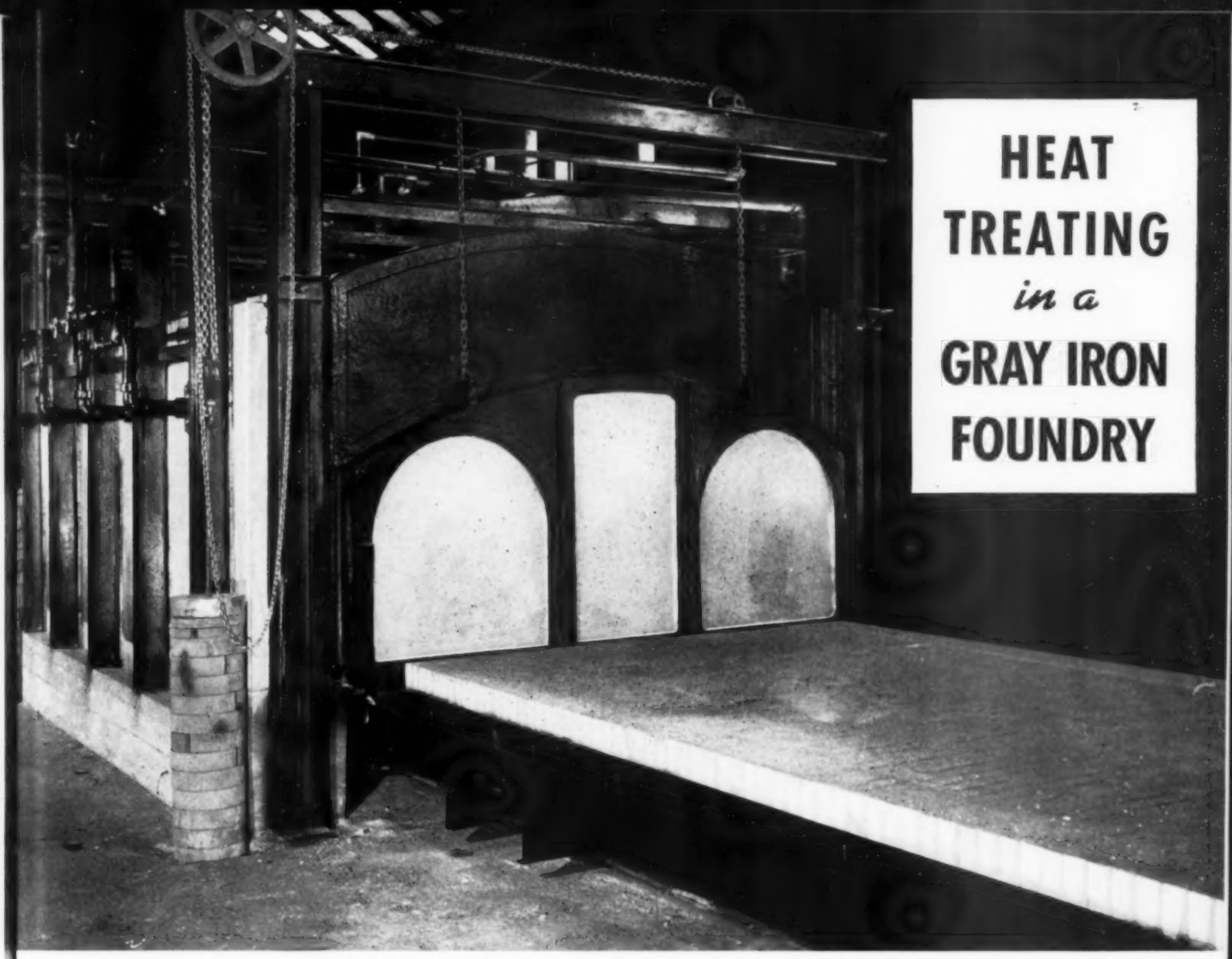
No matter what your use for super refractories may be, or what your refractory problems are, it will pay you to take advantage of Carborundum Engineering Experience and Manufacturing Facilities.

Refractory Division, The Carborundum Company, Perth Amboy, N. J.

District Sales Branches: Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh. Distributors: McConnell Sales and Engineering Corporation, Birmingham, Ala.; Christy Fire Brick Company, St. Louis, Mo.; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Company, Los Angeles, San Francisco, Calif.; Denver Fireclay Company, El Paso, Texas; Smith-Sharpe Company, Minneapolis, Minn.

(Carborundum and Carbofrax are registered trade-marks of and indicate manufacture by The Carborundum Company)

REFRACTORY CARBORUNDUM PRODUCTS



HEAT TREATING *in a* GRAY IRON FOUNDRY

IT'S A

McCANN FURNACE

Doing "A Job" for National Defense!

STRESS RELIEVING ★ ANNEALING ★ NORMALIZING

DIESEL ENGINE CASTINGS
in a large Cleveland foundry.

Result: A uniform and superior product.

UNIFORM HEATING AND COOLING ESSENTIAL
. . . A built-in feature on all McCann Furnaces

★ ★ ★

McCANN ENGINEERS KNOW HOW!
. . . 25 Years Experience

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McCann Furnace Company
INDUSTRIAL FURNACE & HEATING EQUIPMENT

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Core Ovens—Heat Treating and Annealing Furnaces
Complete Recirculating Heating Systems for Existing Ovens

"Hay!" We are not this slow!

Our expanded facilities and efficient organization offer you . . . . . .

Remarkably fast deliveries on North American Burners, Mixers, Regulators, Valves and Accessories.

If you are looking for dependable Combustion Equipment in a hurry, we invite you to try

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THE NORTH AMERICAN MANUFACTURING COMPANY

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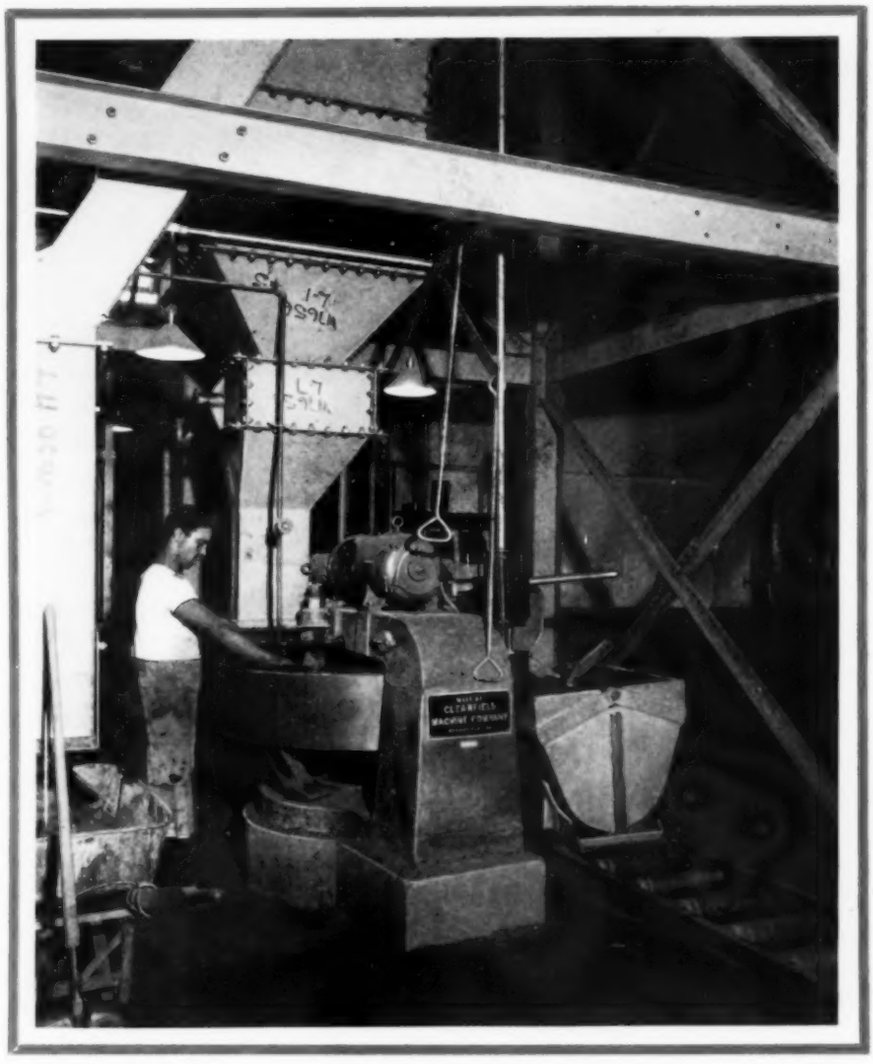
CLEVELAND, OHIO

BRANCH OFFICES WITH FACTORY TRAINED REPRESENTATIVES IN PRINCIPAL CITIES

QUANTITY or QUALITY?



WHY CHOOSE,
WHEN YOU CAN GET
BOTH WITH

CLEARFIELD

?

Here's a
Clearfield 404
Sand Mixer on a
one minute operating
cycle in a modern
brass foundry.

★

TIMKEN BEARING EQUIPPED

Tell us the tonnage you want... We have the Mixer

★ ★ ★ ★

CLEARFIELD
MACHINE COMPANY

CLEARFIELD
PENNSYLVANIA, U. S. A.

Cut Blast Cleaning Costs with this NORBIDE* NOZZLE

IN your cleaning room, too, you'll like the cost cutting performance of Norbide Nozzles — not only their exceptional life (at least 750 hours with sand — 1500 hours with steel grit or shot) but also the way that they decrease air consumption and maintain a stream contour and velocity that improves blasting efficiency.

A new leaflet gives full information about Norbide Nozzles — their features, instructions for selection and use, standard sizes and prices. Write for a copy — no charge nor obligation.

NORTON COMPANY
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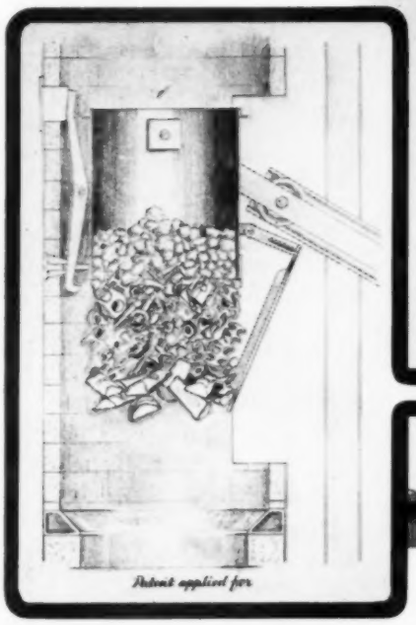
Distributors for
NORBIDE NOZZLES
PANGBORN CORPORATION
HAGERSTOWN, MD.

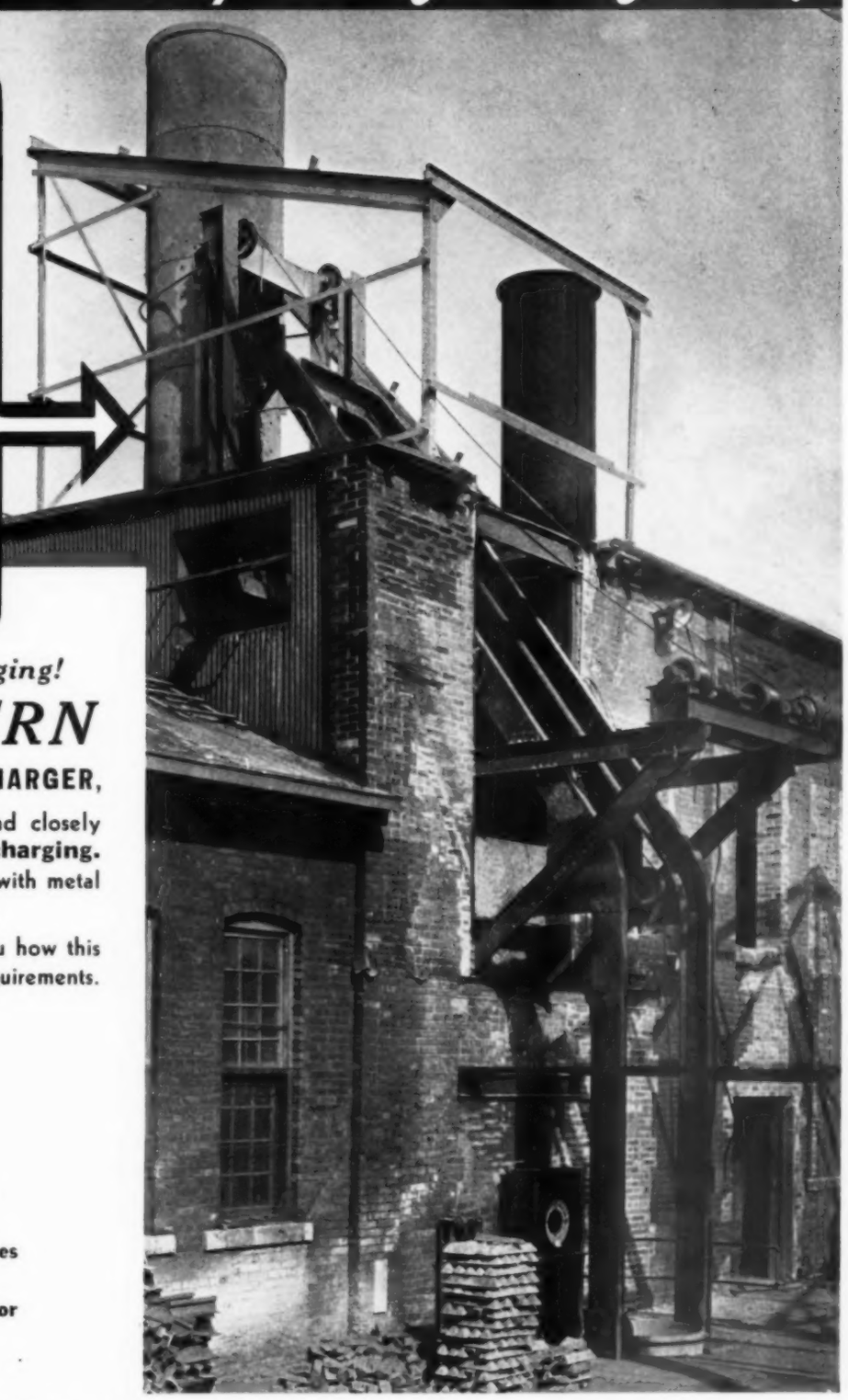
*Norbide is the registered trade-mark for Norton Boron Carbide—the hardest material ever manufactured for commercial use.

N-50

NORTON

Speed up your Cupolas for Defense!





And do a real job of charging!

With the **MODERN**

DROP BOTTOM BUCKET CHARGER,

the charges are laid in evenly, and closely packed. **Equal to best hand charging.** No more end over end dumping, with metal on one side and coke on the other.

Let MODERN engineers show you how this system can be applied to your requirements. Their service at your call.

MODERN

Cupolas
Covered & Insulated Ladles
Lifetime Geared Ladles
Improved Bottom Pour Ladles
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Modern Charger at Pohlman Foundry Co., Buffalo, N. Y.

MODERN EQUIPMENT CO.

LIGNOLITE
PATTERN PLATES

LIGNOLITE

A Marathon Lignin Plastic Pattern Plate
With Pattern Shop and Foundry Approval

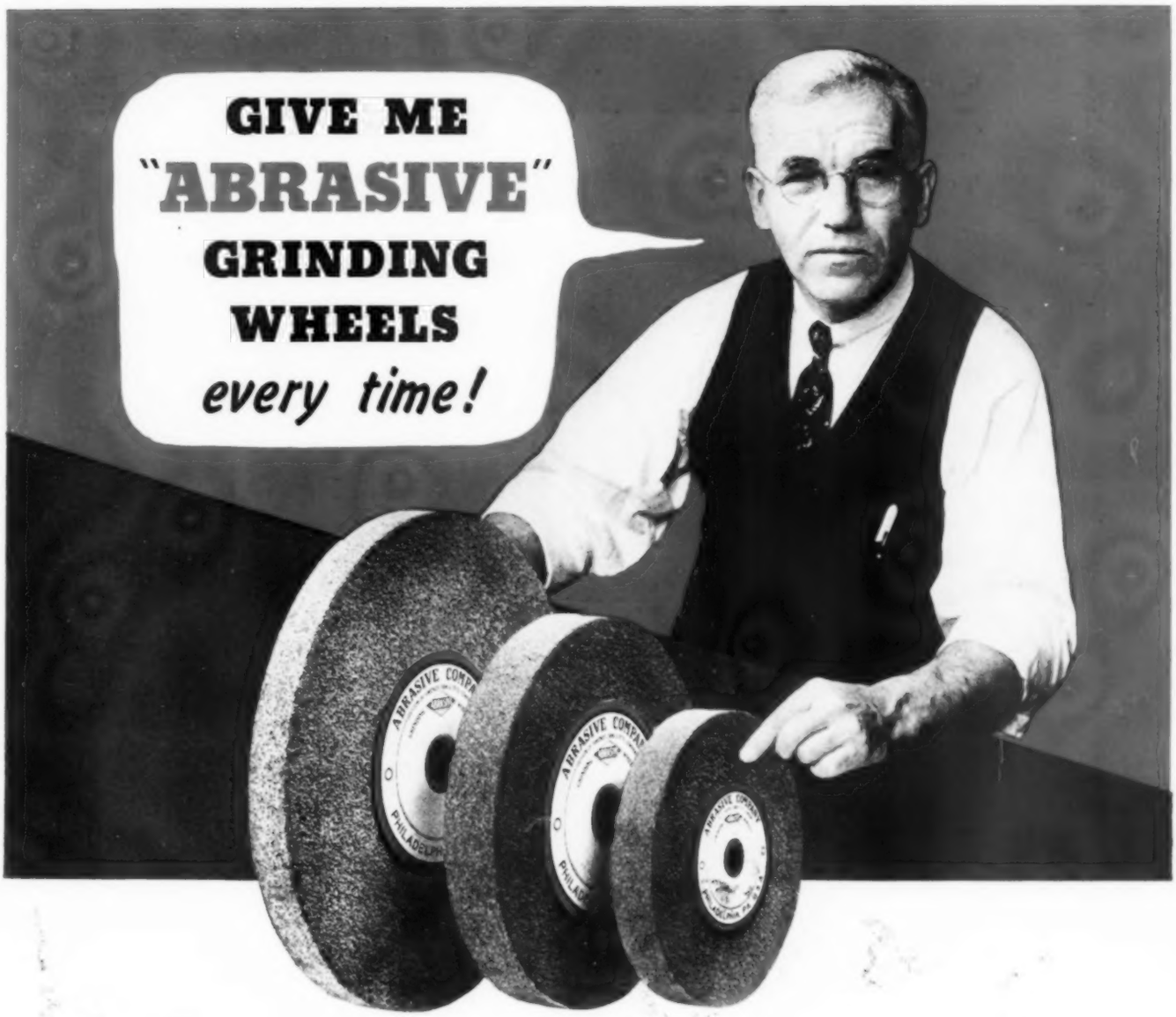
★ WATER PROOF
NON-WARPING
HIGH STRENGTH
LOW COST
ACCURATE
EASILY MACHINED ★

LIGNOLITE IS ONE HALF THE WEIGHT OF ALUMINUM

LIGNOLITE PATTERN PLATES ARE AVAILABLE FOR IMMEDIATE SHIPMENT

MANUFACTURED BY

MARATHON CHEMICAL COMPANY
DIVISION OF MARATHON PAPER MILLS CO.
ROTHSCHILD, WISCONSIN



Smart production men in both defense and non-defense industries ask for ABRASIVE COMPANY GRINDING WHEELS to insure peak performance on their grinding jobs. Fast stock removal, long wheel life and improved surface finishes are qualities sought for . . . and obtained from ABRASIVE wheels. Put them on your grinders for best results. Prompt service from local stocks. Write for details.

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DIVISION OF SIMONDS SAW AND STEEL CO.

TACONY & FRALEY STS., PHILADELPHIA, PA. • DISTRIBUTORS IN ALL PRINCIPAL CITIES

What goes on HERE

ENGINEERING RESEARCH *and* PLANT FACILITIES *for building* WHEELABRATOR AIRLESS ABRASIVE BLASTING EQUIPMENT

1

2

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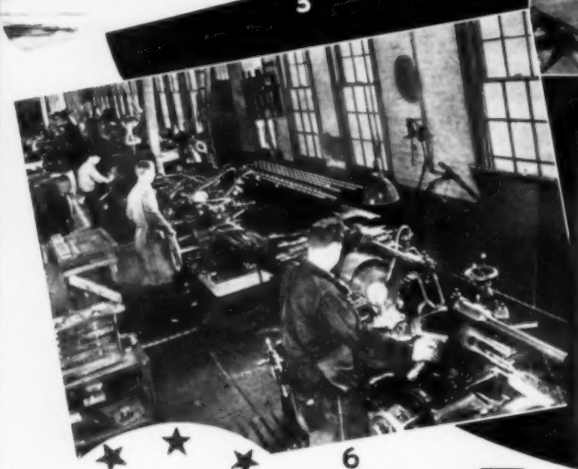

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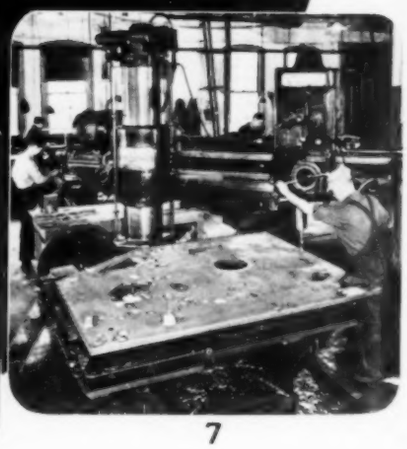


7

1. A view of our plant from the air.
2. A section of the steel layout department.
3. A huge 75,000 pound steel press brake.
4. Balancing WHEELABRATOR wheels.
5. A part of the steel assembly shop.
6. A portion of the machine shop devoted to large, heavy-turning operations.
7. Drilling WHEELABRATOR side frames.

TRADE MARK

THE AMERICAN MOLDER

AMERICAN

AIRLESS ABRASIVE

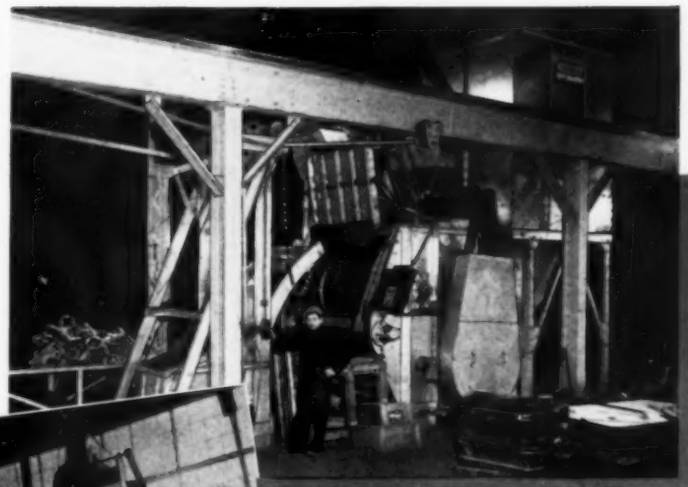
accounts for the

LOW-COST SPEED-CLEANING PERFORMANCE *obtained* HERE

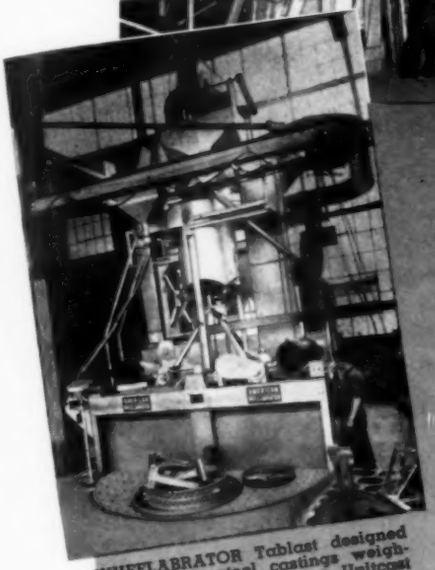
—and in the shops of

MORE THAN 1300 OTHER WHEELABRATOR USERS

throughout the world



Heavy steel castings are cleaned in this 48 x 40" WHEELABRATOR Tumblast at Hartford Electric Steel Co., Hartford, Connecticut.



WHEELABRATOR Tablast designed for cleaning steel castings weighing up to 3,000 lbs. at Unitcast Corp., Toledo, Ohio.

"The WHEELABRATOR equipment has proved to be an improvement far beyond our expectations. We are now getting thoroughly clean, better looking castings at a fraction of our former cleaning cost."

The Central Brass Mfg. Co.

"Since the installation of your WHEELABRATOR we have saved 75% of our labor in cleaning and due to cleaner castings have saved the time of our cutters in cutting off gates and risers."

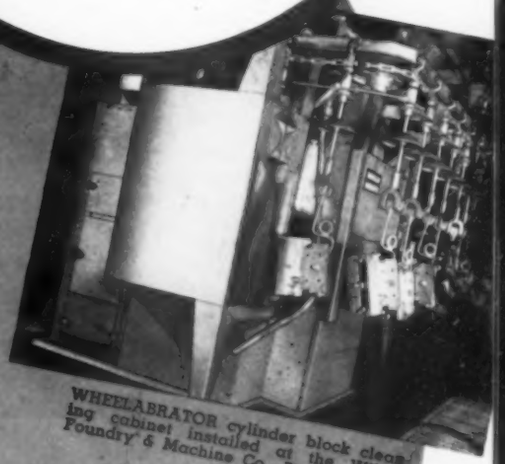
The Hartford Electric Steel Corp.

"We have reduced our cleaning costs a great deal more than we anticipated and maintenance of the WHEELABRATOR Tumblast has been no more than you would normally expect!"

Orishaw Malleable Iron Co., Inc.

"All of our brass castings are cleaned in four hours and iron castings in three hours each day. This compares with the three men working twenty hours each day with our former sand blast."

Dick Brothers, Inc.



WHEELABRATOR cylinder block cleaning cabinet installed at the Wilson Foundry & Machine Co., Pontiac, Mich.

This WHEELABRATOR Tumblast is cleaning and removing the file and burr operations on tool parts at Acme Steel Co., Chicago.

The interior of cast steel shells is cleaned in this Special Cabinet at Auto Specialties Mfg. Co., St. Joseph, Mich.

AMERICAN
FOUNDRY EQUIPMENT CO.
505 S. BYRKIT ST. MISHAWAKA, IND.

WHEELABRATOR

BLAST CLEANING EQUIPMENT

IT MAY BE *Chateaugay* THAT YOU NEED!

RESEARCH WILL NOT STOP!

One of our most important activities at Republic always has been research. Today's emergency has not retarded this work. On the contrary, it has greatly intensified our efforts.

We are carrying on a relentless and unceasing program directed toward the development of new steels for certain critical defense problems and the improvement of present steels.

Laboratory and plant research, commercial market research, product development research—all are exploring every possible avenue which may lead to *better* Republic steels for you in the future.

R. J. Wysor
PRESIDENT

Defense requirements, in many cases, call for intricate castings, for hard wearing surfaces, for castings that will resist heat and acids, that will machine easily and uniformly.

If one of these is your problem—or if you're having casting troubles that prevent the smooth, uninterrupted flow of output on a high-schedule basis — it may be CHATEAUGAY that you need.

This low-phosphorus, copper-free pig iron has "worked wonders" in making difficult situations seem simple. It may do the same in your foundry. A Republic pig iron metallurgist can tell you—and tell you quickly—how CHATEAUGAY pig iron can help you. When would you like to see him?

REPUBLIC STEEL CORPORATION
General Offices: Cleveland, Ohio

Berger Manufacturing Division • Culvert Division • Niles Steel Products Division
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REPUBLIC PIG IRON

THE MOST COMPLETE LINE OF MERCHANT IRON AVAILABLE

"CHATEAUGAY"	"REPUBLIC"	"PIONEER"
Low-Phosphorus Copper-Free	(Northern) Basic, Foundry and Malleable	(Southern) Foundry and Basic

ALSO TRUSCON FOUNDRY FLASKS • REPUBLIC CORE WIRE • FOUNDRY NAILS

EDITORIAL

War Demands Should Develop A Council of Associations

CHANGE from priorities to allocations only will accentuate the problems now facing the foundries of the United States. Unless a united foundry industry can present its case to various defense organizations, and unless these departments of the government have a complete understanding of the extent to which castings of every kind can be used in the building of our war machine, the mortality among foundries, due to inability to secure government orders or to obtain necessary raw materials, will be far greater than necessary. As was discussed on this page last month, the OPM should be informed of the problems and products of foundries by a united industry.

Similar problems appear to have been encountered by the foundries of Great Britain. Therefore, the recent formation of the Council of Ironfoundry Associations, while only bringing one branch of the foundry industry under one banner, should prove interesting to foundrymen in this country. Participating associations in the Council, as presented on page 115, include 11 gray and malleable iron groups. The British Cast Iron Research Association, the Institute of British Foundrymen and the Engineering and Allied Employers' Federation are affiliated groups. Vincent Delport, well known among the foundry industry of the United States, and European manager of THE FOUNDRY, is secretary of the new council.

The *Foundry Trade Journal*, official organ of a number of British groups, including the Council of Ironfoundry Associations, has pointed out that research and technical associations have been included in the new council since, all too tardily, government circles have recognized that scientific and technical thought is of fundamental importance in the conduct of modern affairs. While employers' organizations are included in the new groupings, negotiations as to working conditions within the industry are not included in the council's scope.

The *Foundry Trade Journal* comments further as follows:

> Another factor to be noted is that there is to be no *direct* representation on the Council of Ironfoundry Association, but only indirectly through the participating associations, and here indeed is a wide choice . . . . There remains now not a single reason why every ironfoundry in the country, large or small, attached or unattached, should not support the entirely unselfish efforts which are being made to protect its interests, whilst still doing everything possible to help along the war effort. The new system it will be noticed gives a dual service, for it combines the advantages to be gained from joining any one of the associations listed, together with an assurance that the major problems arising out of the applications of government orders, such as concentration of industries, labor supply, the various distribution schemes, wartime, building regulations, and so forth, will be dealt with by a body—helped by professional advice if need be—built up upon the widest possible base. Firms remaining outside the organization will receive from their colleagues — as they will well merit — the appellation of "mean," for those responsible for the conduct of the Council rightly put the country's needs—not necessarily bureaucratical interpretation — first, and the welfare of the foundry industry next, with special attention to individual hardships, and moreover are doing this as public-spirited people.

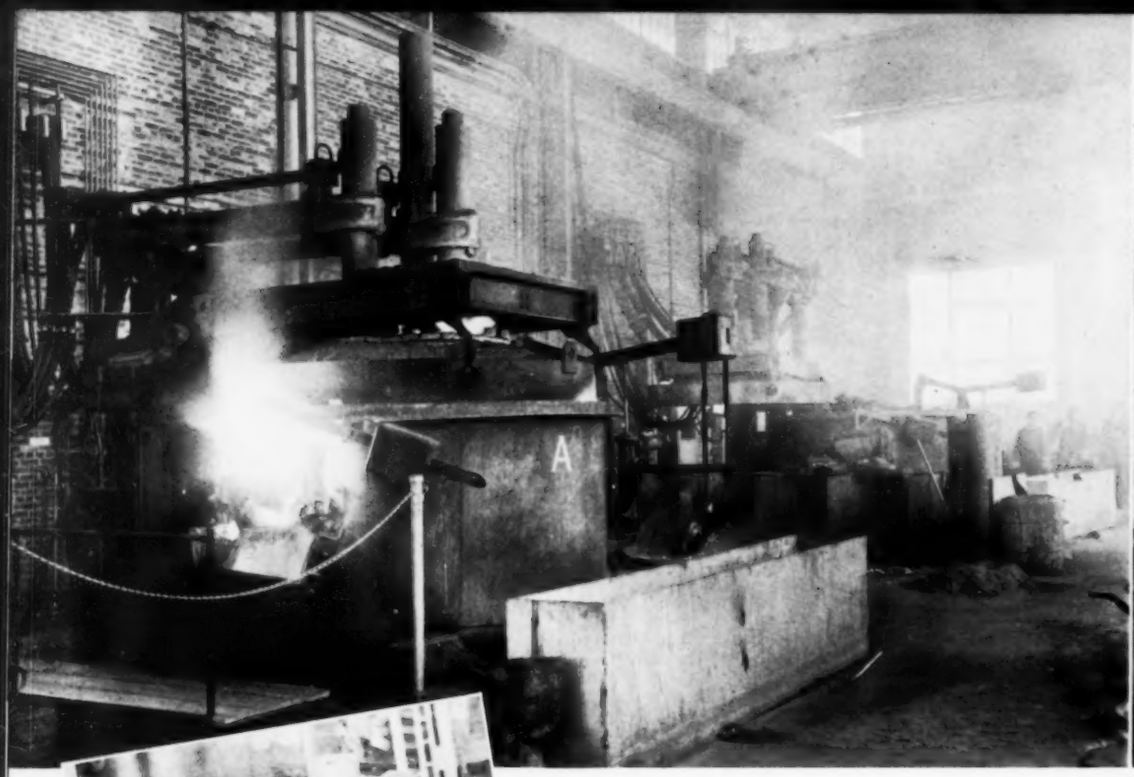
The war effort and the foundry industry of the United States both need a Council of Foundry Associations of America. Such a group could develop to best advantage the fundamental principles of a basic industry serving a nation at war, and could influence trends in the foundry industry as a whole and in the various component branches. Study of the problems of each branch in the light of requirements of the various groups should prove most valuable to all and provide maximum efficiency in the present emergency.

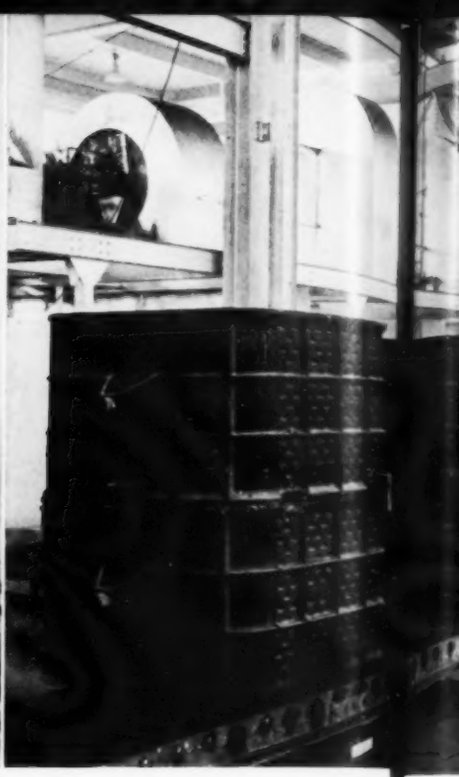
As an example, consider the difficulties now facing the steel castings industry. For sometime that group of foundries has been working at maximum capacity with the product entering almost entirely into defense work. Expansion in that industry has been heavy and at present 12 or 15 large additions or new plants are underway. Acceleration of the war program will necessitate the building of many more new steel foundries. Therefore, as a matter of expediency and to protect the steel foundry industry from any unnecessary overexpansion, might it not be good business and wise procedure for the steel casting industry to assist other branches in substituting pearlitic malleable, malleable, or gray iron castings for steel castings when conceivably the substituted products would meet the needs satisfactorily?

Dealing with such problems, a Council of Foundry Associations of America would pay dividends both at present and in the future.

Frank G. Steinebach

Editor





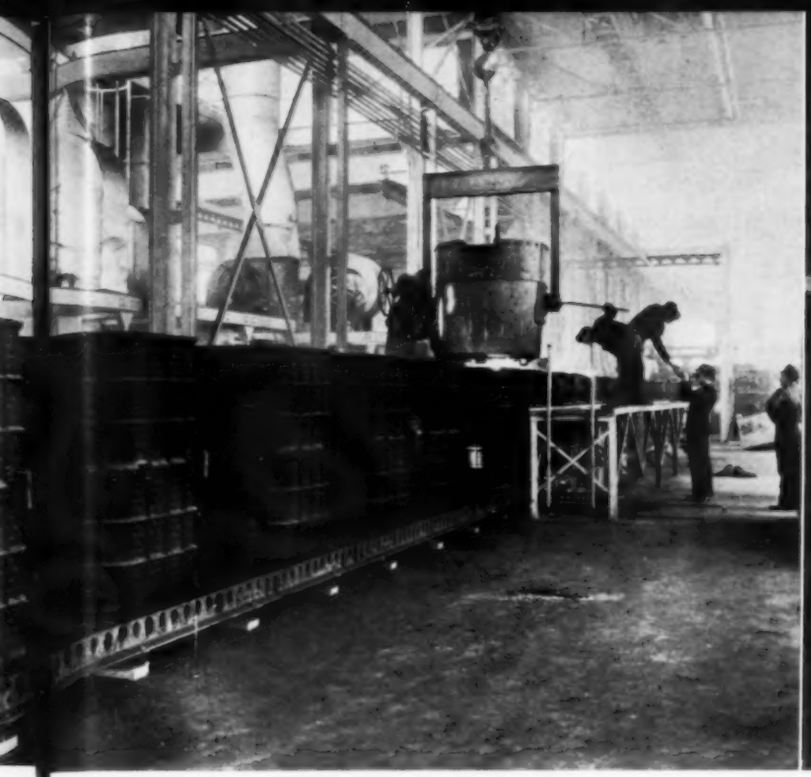
CAST BOMBS in Canadian Plant

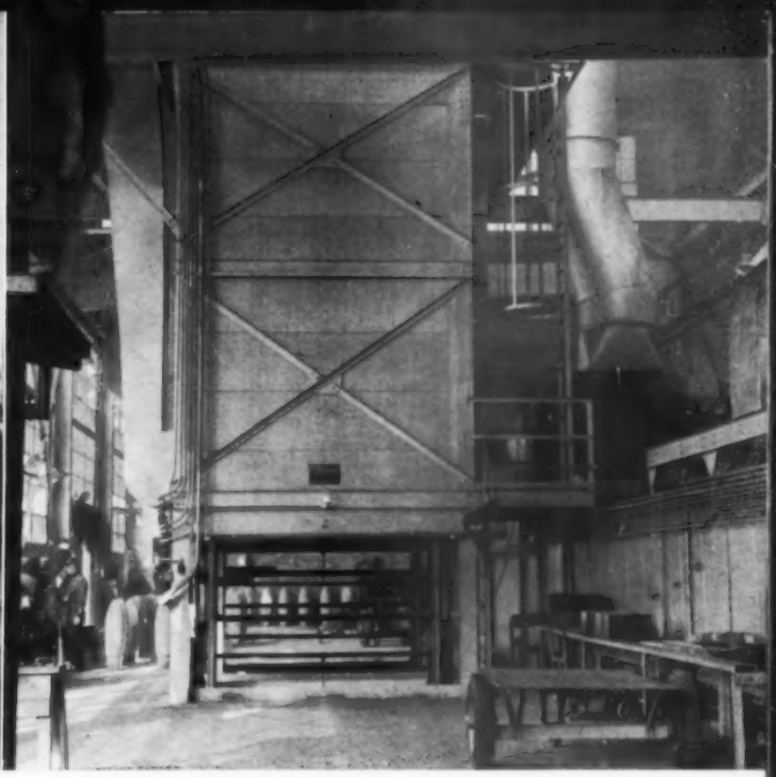
By Pat Dwyer

WITH war orders from the mother country totaling hundreds of millions, whether reckoned in pounds sterling or dollars, and covering almost every conceivable article of commerce from wrist watches to air planes, Canada has been converted almost overnight into a huge work shop, quivering with energy, humming day and night and geared to top speed. Blast furnaces, open hearths, electric furnaces, rolling mills, fabricating shops and foundries are pushed to capacity. Riveting guns are rattling and welding torches are blazing on all manner of air and sea going craft from Halifax and Sydney on the Atlantic seaboard, through the St. Lawrence and the chain of Great Lakes in the middle west and on to the Pacific coast.

Mars, leaning on his club looks on in high approval, while Vulcan sits on his anvil on high Olympus and gleefully pushes his foot—the good one—down on the accelerator of a super, double acting, compound, high speed, streamlined blower supplying air to the myriad forges over which he presides.

The Old Red Duster is flying bravely from every ridge pole and every private and public flag staff in the country. All eligible young men are in uniform. With the exception of a few natural objectors, every man, woman and child is bitterly determined to carry on to a finish, work to the limit and make any needed sacrifice calculated to defeat the enemy. Canada, Kipling's Lady of the Snows, daughter in her mother's house, but mistress in her own is at war. War spelled with a capital *W*. Greatest of all wars in the history of either mother



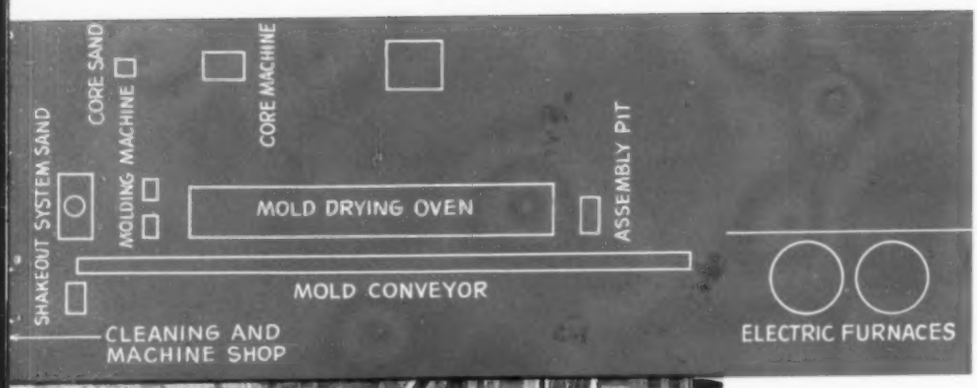


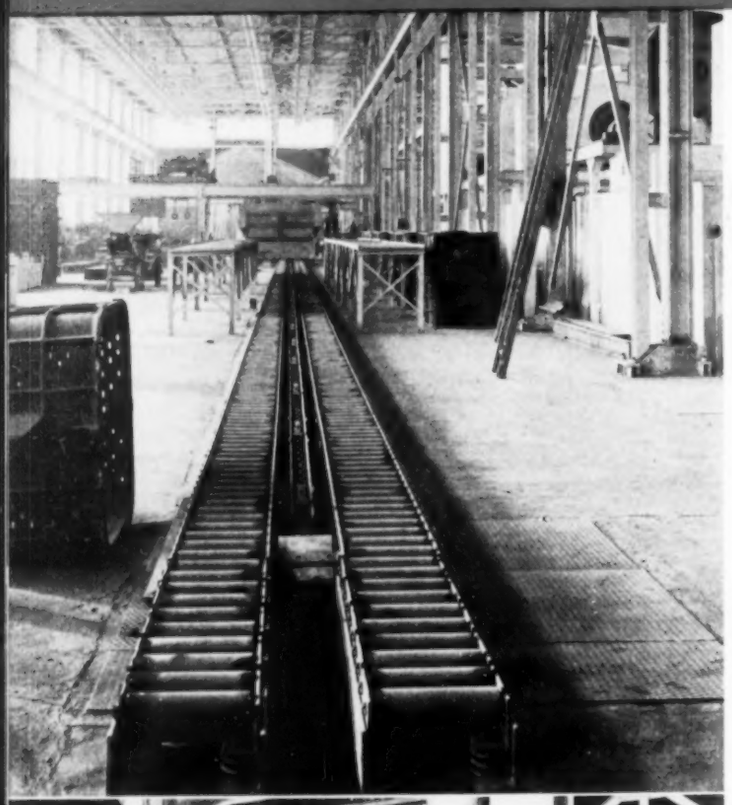
SHELLS

or daughter or of their numerous relatives.

Canada is no amateur at the game of war, regular, standard or catch as catch can, rough and tumble, no holds barred and devil take the hindmost. For over 100 years the English and French fought at, between, before and after meals. Between bouts they fought the ferocious Iroquois, Hurons and Algonquins, original inhabitants of the country who held to the peculiar view that they enjoyed certain priorities and that the white men were interlopers. Gradually and fortunately through immigration and natural increase the white settlers outnumbered the Indians by overwhelming majority. Thus

Fig. 1 (Upper left)—Steel is melted in two 5-ton electric furnaces. Fig. 2 (Left below)—Metal is poured through a central sprue and four single gates at joint line. Fig. 3 (Center above)—Molds are mounted on a conveyor and poured in groups of 7. Each mold contains 4 castings. Fig. 4 (Upper right)—Cores are dried in a vertical oven. Fig. 5 (Center right)—Group of castings with gates and heads removed. Fig. 6 (Lower right)—Sand is blown into the corebox while in a vertical position. Photos from Director of Public Information, Ottawa





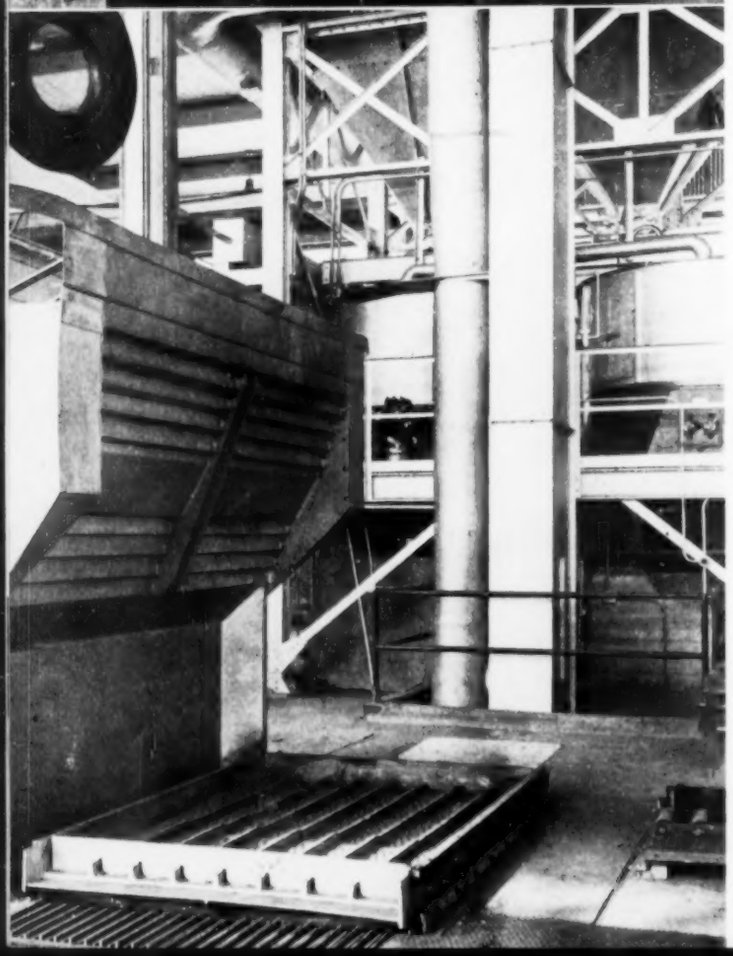
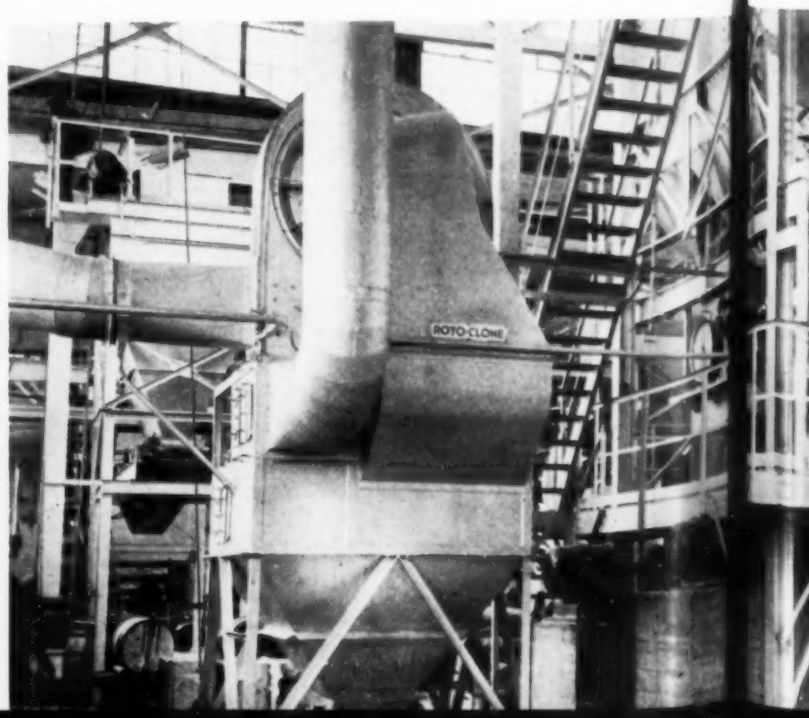


Fig. 7 (Left)—General floor plan not drawn to scale. Fig. 8 (Left center)—At the far end of a power driven conveyor the molds are shaken out on a vibrating screen. Fig. 9 (Lower left)—An exhaust dust arrester over the shakeout screen removes all the dust. A bucket elevator carries the sand back to the mixing station. Photos from Director of Public Information, Ottawa

proving that virtue always will prevail and that right always triumphs over might. This happy solution removed one irritating factor from the three corner game.

French and English carried on nobly in deadly opposition for 100 years, until James Wolfe—Only one *f*—landed his men from ships in the river, recited Gray's "Elegy in a Country Churchyard", scaled a cliff considered impassable to anything less nimble than a fly with suckers on its feet and engaged General Montcalm on the Plains of Abraham. In sporting parlance Jim knocked his opponent out in the first round and ran the Union Jack above the Fleur de Lys. From that day to this, Canada has been a most loyal colony and one of the brightest jewels in the championship belt surrounding the ample waist of the British empire.

From the resulting united Canada, descendants of the two great races have gone forth and fought side by side in Britain's foreign wars. Regardez vous, mes amis, the magnificent bronze equestrian statue in Dominion Square opposite the Windsor hotel in Montreal, memento to the famous Strathcona Horse, which with other Canadian regiments saw extremely active service in South Africa at the turn of the century. Sons of these men with equipment, munitions and supplies poured in a never ending stream across the Atlantic from 1914 to 1918.



In turn, their sons again in camp, on the high seas or in shop, forge or foundry are permeated with the fighting spirit of a free people.

Today a greater, stronger, better equipped and more resourceful Canada is at war, a valiant right hand fighting unit, an integral part of the British empire "Whose morning drum beat" according to the late Mr. Webster in one of his lofty and inspired flights of eloquence "following the sun and keeping company with the hours, encircles the earth with the martial music of the greatest empire the world ever has known." Dan never spared the adjectives.

In many instances since the first rumbling of the guns indicated another European conflagration, Canadian plants were expanded and extended to cope with the flood of war orders. In other instances entirely new plants were erected and equipped for the purpose. In a normal plant operated by an ordinary staff the problem of introducing great numbers of unskilled and untrained men was solved in a fairly satisfactory manner by skillful distribution and infiltration. Where the entire personnel has to be trained in methods and familiarized with conditions far removed from their former fields of activity, if any, the already complicated problem by common consent is sufficient to try the patience of the blessed St. Francis of Assisi. Perhaps a better object of comparison would be the sterling old patriarch, Job, champion pesteree of all time.

Consider a typical instance. In August, 1940 the president of a prominent foundry company announced to his general manager that he had taken a contract for casting—well, a great number of steel bomb bodies per day. The G.M. admitted the news was quite interesting. Had the president any idea where, when or how these castings could be made without a site, a plant or a single experienced operator? The president claimed these were (*Please turn to page* 133)

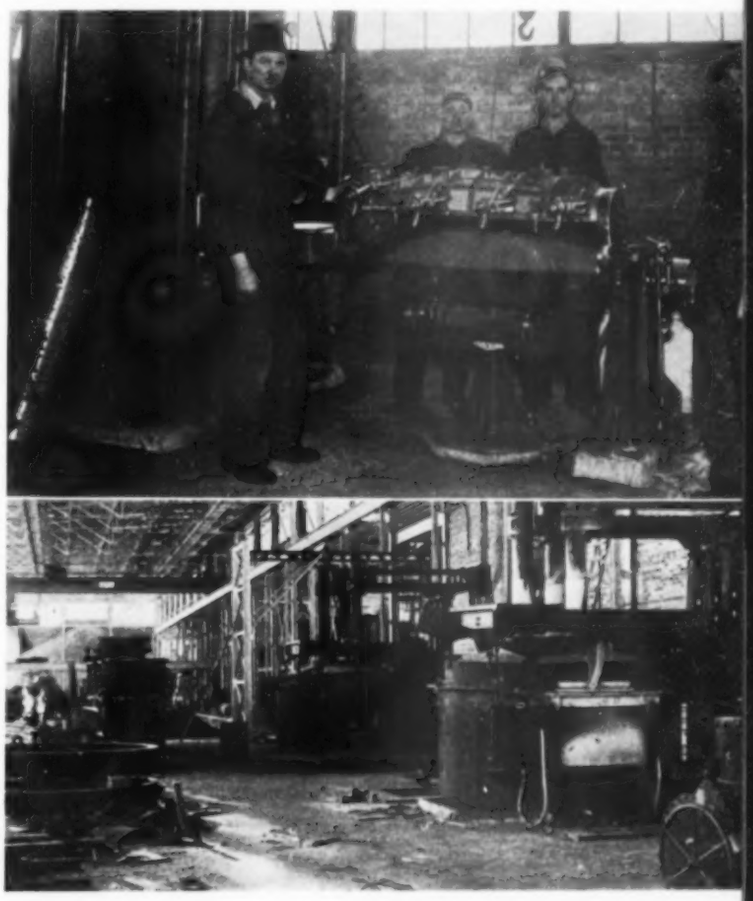
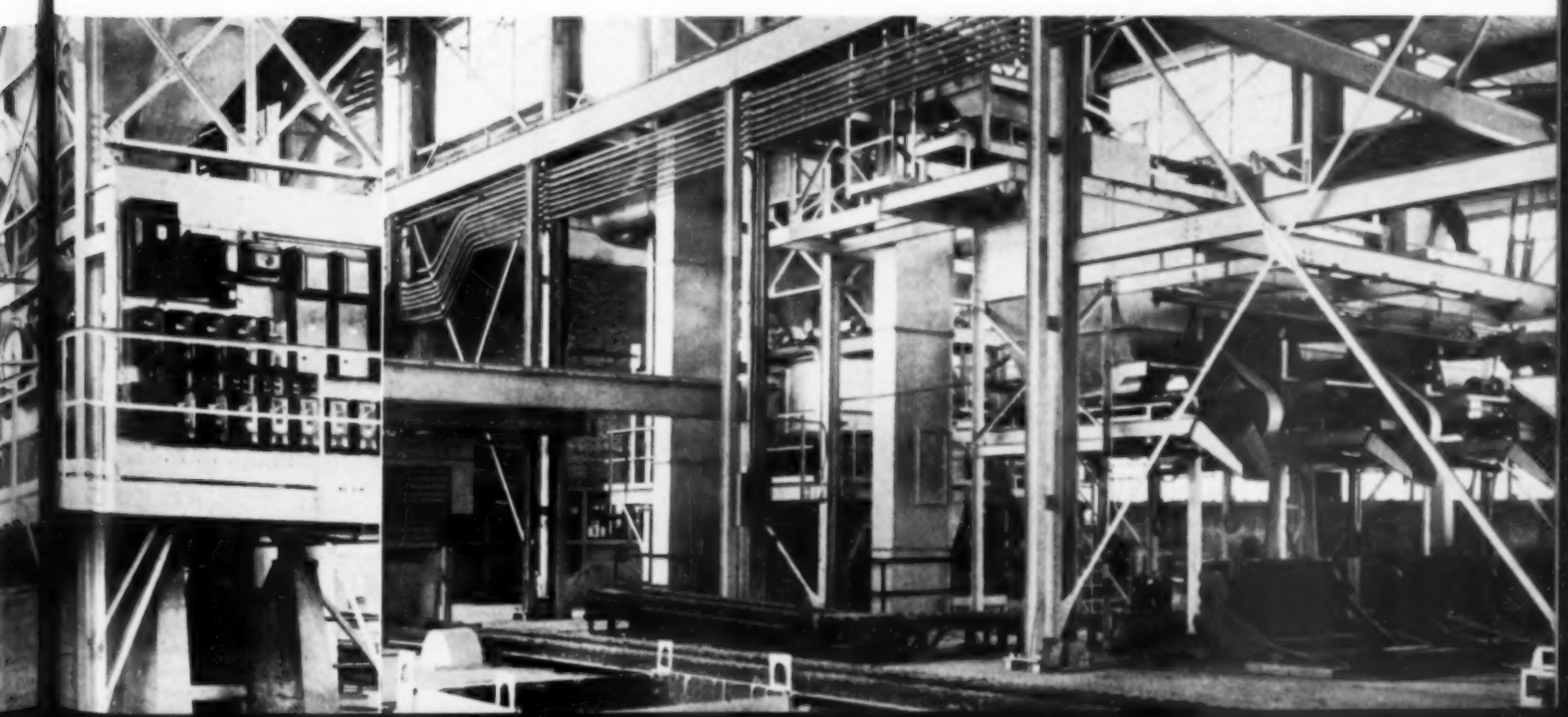
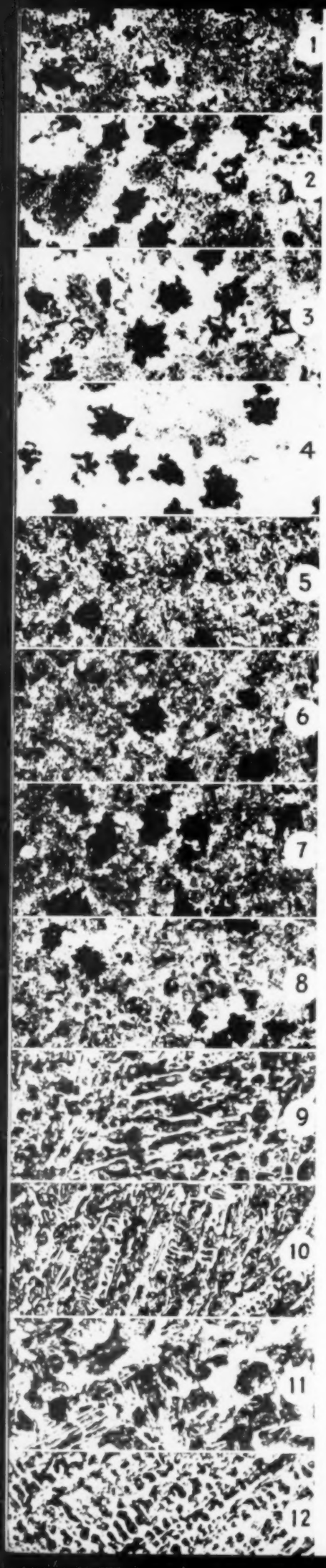


Fig. 10 (Lower center left)—A number of switches mounted on a panel, control all the functions of the sand preparation equipment. Fig. 11 (Below)—Molds are made on two rollover jolt machines fed with sand from overhead chutes. Fig. 12 (Upper right)—The core is lowered from the corebox. Fig. 13 (Lower right)—Electric furnaces are located near one end of the foundry. Photos from Director of Public information, Ottawa





CASTINGS

Replace Forged Steel Parts

MATERIAL to be discussed is known to the industry as ArmaSteel, which in some cases is referred to as a graphitic steel, since the matrix closely resembles that of a spheroidized steel. The combined carbon in the matrix gives to the metal properties which compare favorably with those of forgings in the SAE 1035-1050 range.

This product is made from white cast iron of the following composition: 2.65 per cent carbon, 1.30 per cent silicon, 0.40 per cent manganese, 0.13 per cent sulphur, and 0.05 per cent phosphorus. The metal charge is melted in a cupola, and refined and superheated in an electric furnace. Very close chemical control is followed from the raw materials to the finished product. Rigid metallurgical control is maintained on all operations.

Heat treating of the castings to produce the desired surface is one of the most important operations in the production. Here we use radiant tube furnaces fired with natural gas. The furnace atmosphere is controlled within close limits to prevent any decarburization taking place.

Castings are brought to the proper temperature to remove all the massive carbide, then air or oil quenched from 1600 degrees Fahr. This is followed by a draw treatment to improve machinability and control physical properties.

In the interest of national defense it has become increasingly important to reclassify many automotive, refrigerator, tank, machine gun and other parts in order to have enough steel and nonferrous metals to go into those parts which do not offer any replacement possibilities.

There has been a tendency in recent years to replace certain forgings with castings in the automotive field, and this gradually is following through in other industries. Many engineers are inclined to put aside the marked improvements in metallurgy as applied to foundry operations, which have developed in the past decade.

Fig. 1—Air quenched from 1700 degrees; drawn at 1250 degrees for 6 hours, brinell 4.30 millimeters. Fig. 2—Air quenched from 1700 degrees; drawn at 1250 degrees for 8 hours; brinell 4.50 millimeters. Fig. 3—Air quenched from 1700 degrees; drawn at 1250 degrees for 10 hours; brinell 4.70 millimeters. Fig. 4—Air quenched from 1700 degrees; drawn at 1250 degrees for 12 hours; brinell 5.10 millimeters. Fig. 5—Air quenched from 1700 degrees; brinell 3.60 millimeters. Fig. 6—Air quenched from 1700 degrees; drawn at 1250 degrees for 2 hours; brinell 3.80 millimeters. Fig. 7—Air quenched from 1700 degrees; drawn at 1250 degrees for 4 hours; brinell 4.05 millimeters. Fig. 8—Air quenched from 1700 degrees; drawn at 1250 degrees for 5 hours; brinell 4.15 millimeters. Figs. 9, 10 and 11—Microstructure of as-cast sections from brake flange hub. Fig. 12—As-cast microstructure of small lever casting. All micrographs etched 4 per cent nital; 100 diameters

By CARL F. JOSEPH
Chief Metallurgist
Saginaw Malleable Iron Division
General Motors Corp., Saginaw, Mich.

Constant pressure is being brought by the engineers to reduce weight, increase physical properties and cut manufacturing costs. The desire to increase the use of castings has caused the foundryman to venture into hitherto unexploited fields in order to find new uses which have often been considered outside of the range of practical accomplishment.

Proper material to select for any given purpose is that which will perform the required service at the lowest ultimate cost, provided it can be obtained in the necessary quantity. Intelligent selection and utilization of materials of construction are important factors both in the development of new and improved parts, as well as in the extension of their use.

Whether the choice be a casting or a forging is in many cases a matter of personal opinion. Of course, many engineers are steel minded, and the choice of a casting would be furthest

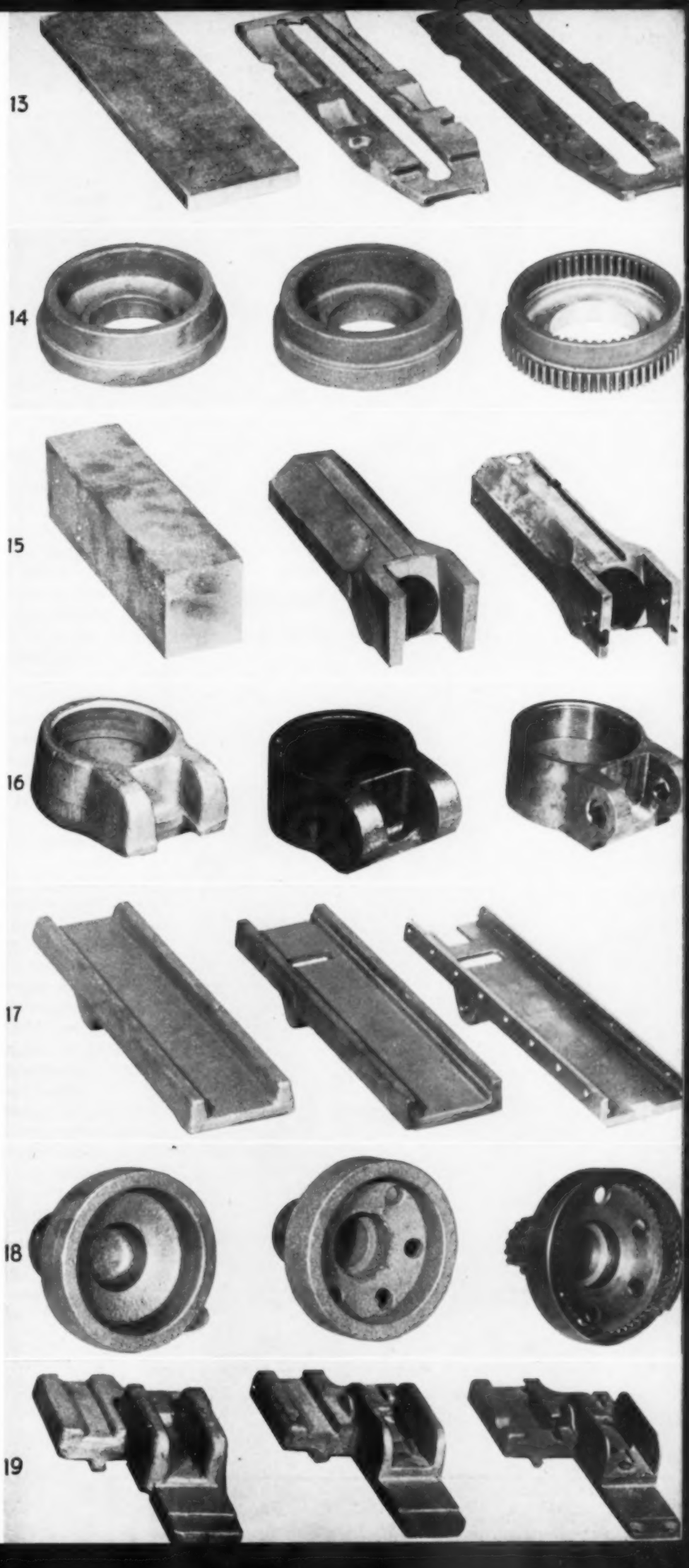
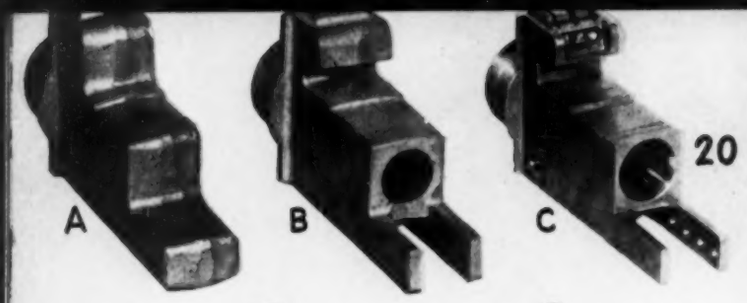
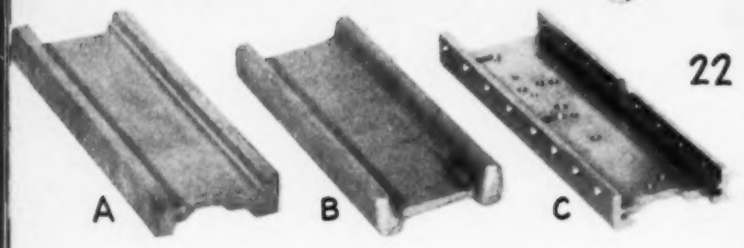
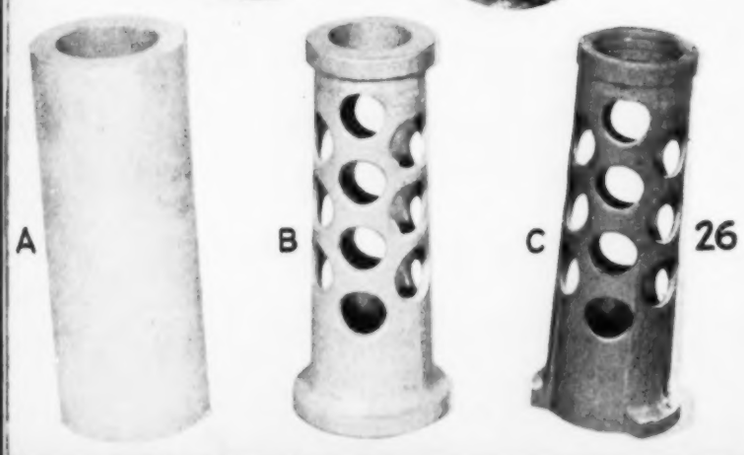


Fig. 13—Machine gun retracting slide bracket showing, left to right, bar stock, rough casting and machined casting. Fig. 14—Reverse internal automotive gear from left to right—forging, rough casting, and machined casting. Fig. 15—Machine gun oil buffer body showing left to right bar stock, rough casting and machined casting. Fig. 16—Trunnion adapter from left to right—forging, rough casting and machined casting. Fig. 17—Machine gun bottom plate showing left to right forging, rough casting and machined casting. Fig. 18—Automotive front unit drum from left to right—forging, rough casting and machined casting. Fig. 19—Machine gun rear sight base from left to right—forging, rough casting and machined casting







from their consideration. But, it is true that stresses, methods of fabrication, possible change in design, and equipment often favor castings for many parts.

The foundryman producing graphitic steel castings must take a long range view of his possibilities of continuing to produce this special metal. A few years ago such promotion usually meant competition with ferrous and nonferrous castings, forgings, weld fabricated structures, etc. Today, producers of those materials have plenty to do to get out production and less time to look into competitive markets.

Take the automotive piston for instance. Aluminum alloys machine more readily, have better heat conductivity and have less weight of moving parts. These offset the undesirable expansion characteristics of the metal (which are compensated by design) and the higher cost of the metal per pound. Today, it appears that pistons will have to be made from some other material. At present, automotive and diesel engines are successfully operating with pistons made from graphitic steel.

View Future With Caution

In an emergency many prejudices and preferences must be thrown overboard. Let it be assumed for the moment that the present emergency may bring about considerably more wide spread use of graphitic steel as a replacement. It would be short sighted, indeed, to accept such changes as an act of Providence and let it go at that.

Unless foundrymen are alert to the possibilities, more ultimate harm than good may come from such replacements. Many applications have been brought to the attention of the foundryman, not because the manufacturer was willing to use another material, but because he found it necessary in order to continue to operate his plant. The old proverb "Necessity is the mother of invention" has been found to hold true in the expanding use of ArmaSteel.

Gage of any return to such parts as aluminum alloy pistons will be its engineering performance versus graphitic steel, availability of the metal, and its ultimate cost. The current enormous expansion of the alumi- (*Please turn to page* 137)

Fig. 20—Machine gun trunnion block with forging A, rough casting B, and machined casting C. Fig. 21—Automotive rear propeller shaft flange A and C—front universal joint yoke B and D. Fig. 22—Machine gun top plate showing forging A, rough casting B and machine casting C. Fig. 23—Automobile valve rocker arms, A, B, C and D. Fig. 24—Locomotive diesel pistons, 8½ inches in diameter. Fig. 25—Automobile shifter forks. Fig. 26—Machine gun support barrel showing steel tubing A, rough casting B and machined casting C

GRAY IRON FOUNDERS' SOCIETY

Considers Industry's Problems

Above right—A. C. Denison, Fulton Foundry & Machine Co., Cleveland, was elected president. Right—R. D. Phelps, Francis & Nygren Foundry Co., Chicago, was elected vice president. Below right—W. W. Rose was re-elected executive vice president

ANNUAL meeting of the Gray Iron Founders' Society, held at the Hotel Cleveland, Cleveland, Oct. 20, featured a review of the progress of that organization during the past year, a study of future plans, and a discussion of the part the gray iron foundry industry must assume in the successful development of the nation's defense effort. The meeting was one of the most successful in the history of the society, both from the standpoint of attendance and interest in the various discussions.

W. W. Rose, executive vice president of the society gave a detailed report of the activities of the society, including the growth of influence and service brought about by the opening of an office in Washington recently. Through this office, the society is in position to keep its members informed of present and possible future activities of defense organizations as they affect the foundry industry, to present the merits of gray cast iron in many defense applications, and to assist its members in solving problems occasioned by priority and other governmental orders.

Mr. Rose also indicated the progress which has been made in membership, and discussed numerous services of the society including the *Bulletin;* cost accounting; employment; wage, hour and working conditions survey; the work of selling gray iron castings; collection of statistics, and the many demands arising through the national defense program. He pointed out that the demand for gray iron castings should increase considerably as the defense effort accelerates, due to the inability of other methods of fabrication to meet war demands, and to the availability of gray iron for many purposes as yet not recognized by the government.

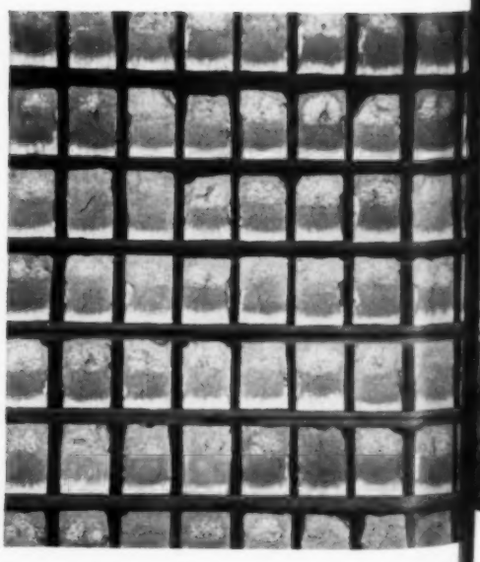
Charles J. Miller, Fremont Foundry Co., Fremont, O., and retiring president of the society, stressed the heavy responsibility and obligation which confronts the Gray Iron Founders' Society at this time when war and defense overshadow all other considerations. President Miller suggested the need for studying the practicability of a clearing house to handle the sub-contracting of surplus orders for castings, and recommended consideration of employing competent engineering talent to investigate and recommend new applications for gray iron castings.

S. C. Mefford, Auburn Foundry Co., Auburn, Ind., presented the report of the treasurer, and the report of the membership committee, showing a net gain of 76 members since the last annual meeting, was presented by Mr. Rose. Frank G. Steinebach, Chief, Foundry (*Please turn to page* 136)

MELTING QUALITY CASTINGS in the Cupola

By Harold S. Austin

Buick Motor Division
General Motors Corp., Flint., Mich.



ANOTHER characteristic of prime importance is the closeness of the fracture of the iron. Conditions demand a close grained iron. The larger chill test bar shown in Figs. 4 and 6 in the November issue is designed for the purpose of showing the quality of the metal in this respect, as well as the hardness. Probably the most important factor which determines the fracture of the iron is the size and shape of the graphite flake and the amount present in the iron.

Must Consider Many Factors

There are a number of considerations to be taken into account in the attainment of a close grained iron, and some of these are, quality of the coke and the amount used in the coke charges, amount of air—especially the velocity of the air passing through the charges, components of the cupola mixture and the percentage of each, and the kind and amount of flux used.

An iron containing a maximum of 2.75 per cent graphite as cast, generally can be counted on to have a close fracture, for all sizes of castings used in the automotive industry. With larger castings that figure may not hold, where the rate of solidification and drop in temperature is much slower. There are six potent factors in the author's opinion that control the fineness of fracture:

Velocity of the air through the stock, proportion of the several components in the mixture—such as steel, pig iron, borings and scrap iron, the silicon content, continuous or intermittent operation of the cupola, the amount of coke in the charges and the amount of iron held in the well. Therefore, from the foregoing statement the following practice favors a close fractured and uniform iron:

Fast melting, large percentage of steel and scrap iron in the mixture, continuous operation of cupola at constant blast, maintenance of a constant level of iron in the well, silicon held as low as possible and the use of the smallest amount of coke on the charges that will continue to supply hot iron.

Proper machinability must be maintained and this is accomplished through control of hardness and metal structure. While mold conditions and foundry practice are important, the greatest portion of the responsibility rests upon the metal. Density of the iron as shown by the fracture and regulated chiefly by the amount of combined and graphitic carbon is probably the most important factor in the machinability of the iron, although the amount and kind of alloys present, and structurally speaking the amount of massive formations of cementite and iron phosphide eutectic are also of great importance and should be held as low as possible.

Fluidity Is Important Feature

It seems hardly necessary to stress the importance of fluidity in the production of good castings. Experience leads to the belief that the two important factors affecting fluidity are composition and temperature. The percentage of silicon and carbon are the two elements in the composition which exert the most influence, and especially the carbon. Almost invariably, when a drop in fluidity is experienced, and the temperature is right, it is found that the total carbon has decreased, and 0.15 to 0.20 per cent drop has a marked effect.

That decrease in carbon or in temperature reflect directly on cupola operations and usually is found to be due to the start of a bridging condition with a rise in air pressure. The presence of certain foreign (*Please turn to page* 140)

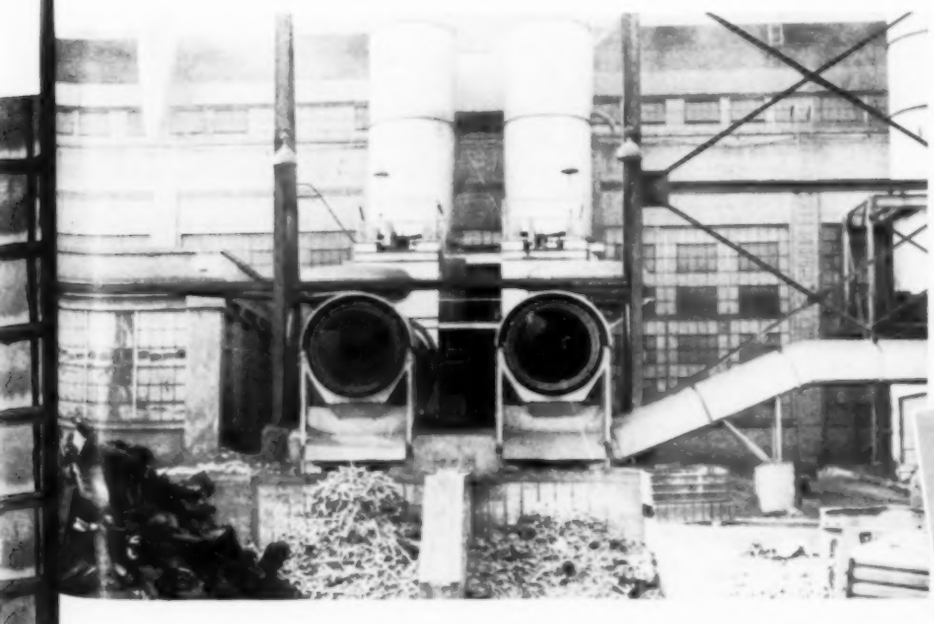


Fig. 7 (Upper left)—Filling up the pouring ladle from the transfer or carrier ladle. Fig. 8 (Lower left)—Charging the cupola with buckets. Fig. 9 (Left center)—Rack containing series of chill test specimens. Fig. 10 (Left)—Tumbling barrels remove sand from gates, risers, etc. Fig. 11 (Below)——Mold and test specimens for spiral fluidity test

INTERNAL CHILLS

Used in Small Steel Castings

By C. E. WESTOVER

THE castings industry has many problems, among them, the production of sound castings. There are castings of all types, sizes and designs. The making of small steel castings with unequal metal sections, presents its own peculiar problem. This problem is to make a sound casting whose internal structure will be free of cavities which are known as *pipes* and *shrinks*.

In order to obtain the desired result the foundryman can resort to the use of some agent. It is an agent known as *internal chill* and its place in the production of small steel castings that is the subject of this article.

To find what had previously been written on this subject, the *Transactions* of the American Foundrymen's Association were consulted. Although it was found that no paper was devoted in its entirety to the subject, there were several papers which made reference to internal chills. It was quite apparent after reviewing them that the using of internal chills is regarded with a considerable variance of opinion.

George Batty in his official A. F. A. exchange paper for the July, 1935 meeting of the Institute of British Foundrymen, had this to say—"In promoting controlled directional solidification external chills can be made to function efficiently upon parts that could never be adequately dealt with by internal chills, and this without the dangers of blows and the inhomogeneities resultant upon the use of cast in denseners."

In 1940, H. F. Taylor and E. A. Rominski of the Naval Research Laboratory presented a paper entitled "Chaplets and the Steel Casting." Introductory remarks with reference to the paper made this statement—"Many castings are rejected or repaired daily because of lack of fusion or some other defect occurring in the vicinity of a chaplet or internal chill."

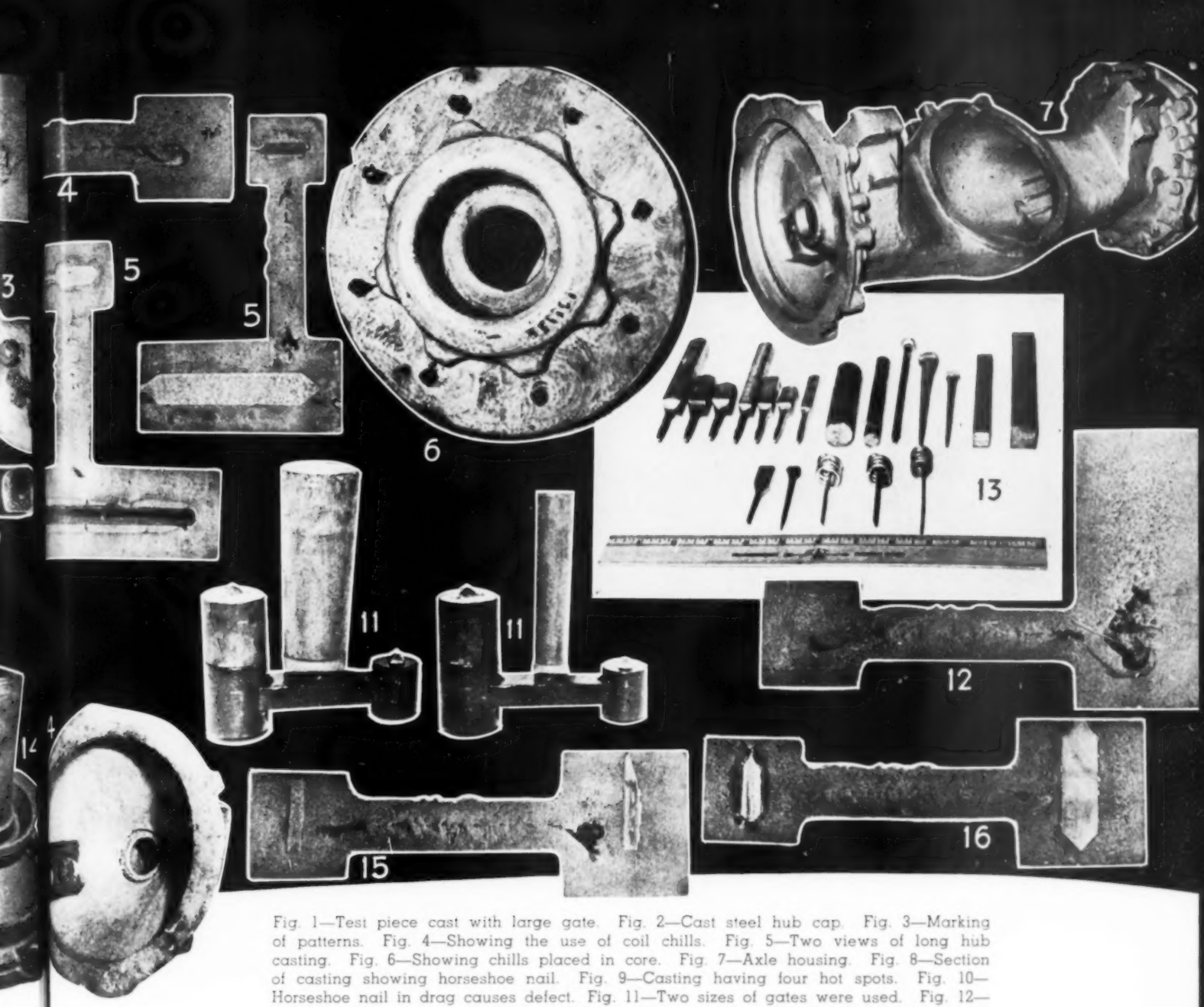


Fig. 1—Test piece cast with large gate. Fig. 2—Cast steel hub cap. Fig. 3—Marking of patterns. Fig. 4—Showing the use of coil chills. Fig. 5—Two views of long hub casting. Fig. 6—Showing chills placed in core. Fig. 7—Axle housing. Fig. 8—Section of casting showing horseshoe nail. Fig. 9—Casting having four hot spots. Fig. 10—Horseshoe nail in drag causes defect. Fig. 11—Two sizes of gates were used. Fig. 12—Boss shows shrink cavities. Fig. 13—Various types of chills. Fig. 14—Cast steel spindle. Fig. 15—Casting with short hub. Fig. 16—Elongated head, horseshoe nail lacks effectiveness in large boss

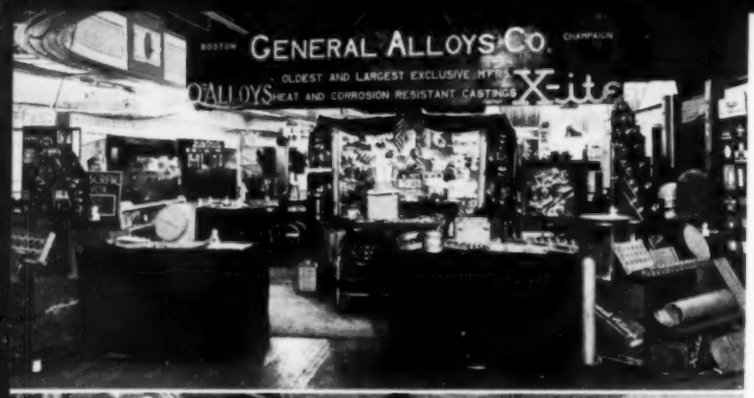
Again in 1940, J. A. Duma and S. W. Brinson of the Norfolk Navy Yards presented a paper before the A. F. A. on the subject "Application of Controlled Directional Solidification to Large Steel Castings." In telling of an experience in connection with the making of a 20,000 pound stockless anchor, the failure of one of these castings under a drop test in cold weather and what was done to make a satisfactory casting, they made these remarks:

"Susceptibility to cold brittleness under impact was partially overcome by increasing the holding time, on annealing, from 30 to 38 hours, together with the employment of approximately 1000 pounds of internal chill bars (½ inch thick by 1½ inches wide by 12 to 36 inches long) arranged checkerwise in the flukes. It is the policy of the foundry to rarely resort to the use of internal chills, in fact, not at all, in small size sections (up to 9 inches thick). Regarding their use in heavy sections, there are occasions, such as this one, when their use is well nigh unavoidable."

A paper was presented in 1938 entitled "Steel Casting Design for the Engineer and Foundryman." The authors, C. W. Briggs, R. A. Gezelius and A. H. Donaldson, all at that time connected with the Naval Research Laboratory, devoted a portion of their paper to the subject "Internal Chills."

Under the heading "Designing to Prevent Contraction Cavities," they say—"When liquid steel solidifies progressively from the mold surface toward the center of the mold cavity, a pipe or contraction cavity will result unless the section is fed from some reservoir containing liquid steel. If, however, the section is unable to draw liquid metal from other sources because these inlets have completely solidified, then a defect will appear in the unfed section.

"Castings with defects of this type, under vibratory stress aided by stress centralization, may develop cracks (*Please turn to page* 145)



Display CAST

IMPORTANCE of castings in the industrial field was illustrated clearly at the National Metal Congress and Exposition held in Philadelphia, Oct. 20 to 24, in connection with the twenty-third annual meeting of the American Society for Metals. More than 30 foundries exhibited a wide variety of castings to the thousands of visitors who attended the metal show which surpassed any held previously. One feature of the castings exhibit was the joint cooperative display in which 20 steel foundries along the Eastern Seaboard participated.

Firms included among the exhibitors were: Aluminum Co. of America, Pittsburgh; American Magnesium Corp., Pittsburgh; American Manganese Steel division, American Brake Shoe & Foundry Co., Chicago Heights, Ill.; Ampco Metal Inc., Milwaukee; H. W. Butterworth & Sons Co., Bethayres, Pa.; Baldwin Locomotive Works, Philadelphia; Cramp Brass & Iron Foundries, Philadelphia; Dow Chemical Co., Midland, Mich.; Driver-Harris Co., Harrison, N. J.; Farrand Foundry Corp., Bloomfield, N. J.; General Alloys Co., Boston; Ohio Steel Foundry Co., Springfield, O.; Standard Alloy Co., Cleveland; Standard Steel Works, Burnham, Pa.

INGS *at the Metal Show*

The steel foundry group display included Adirondack Foundries & Steel Co., Watervliet, N. Y.; American Steel Castings Co., Newark, N. J.; Atlantic Steel Castings Co., Chester, Pa.; Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; Crucible Steel Casting Co., Lansdowne, Pa.; Deemer Steel Castings Co., New Castle, Del.; Dodge Steel Co., Philadelphia; Empire Steel Castings Inc., Reading, Pa.; Farrel-Birmingham Co., Philadelphia; General Steel Castings Corp., Eddystone, Pa.; Hartford Electric Steel Corp., Hartford, Conn.; Hunt-Spiller Mfg. Co., Boston; Lebanon Steel Foundry, Lebanon, Pa.; Malleable Iron Fittings Co., Branford, Conn.; Penn Steel Castings Corp., Chester, Pa.; Pennsylvania Electric Steel Castings Co., Hamburg, Pa.; Reading Steel Castings division, American Chain & Cable Co. Inc., Reading, Pa.; Treadwell Engineering Co., Easton, Pa., and Vulcan Iron Works, Wilkes Barre, Pa.

On Thursday afternoon, Oct. 23, a technical session was held on (*Please turn to page* 151)

Planning the NONFERROUS FOUNDRY

By N.K.B. Patch

IN PLANNING for erection of a nonferrous foundry a number of factors are of primary importance. The first is the shape and size of the available plot of ground, and next in importance is the type of work contemplated and the amount demanded. Obviously if the foundry is going to produce small castings in relatively small quantities the type of building and equipment would be materially different from one to produce similar small castings but on a mass production basis, or a foundry where larger castings are to be produced even in small quantities.

Foundry Plans Differ Materially

If the foundry is planning to produce heavy machinery castings the plant and equipment again must be materially different. However, bronzes and brasses in particular are not so widely used as iron or steel and therefore, the large foundry producing bronzes and brasses will usually be called upon to produce a variety of sizes and shapes of castings unless it is a captive foundry devoted to the production of the parts of machinery produced by the parent company or unless it is producing valves or plumbing supplies or the like.

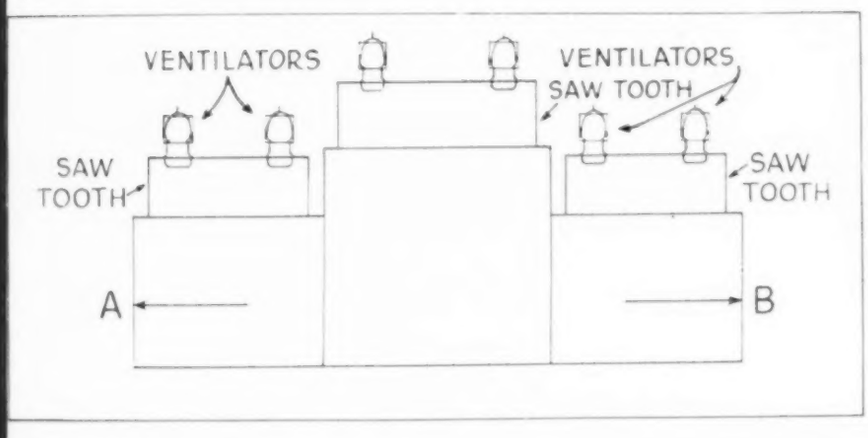
However, there are certain major factors in the ideal foundry for production of non-ferrous metal castings that are important to all of these different types of production and the building and equipment that will produce the maximum product at a minimum cost is the one we would like to discuss now.

Obviously the foundry should be fireproof and provision for abundant natural illumination will aid in economical production. There has been considerable debate as to the ideal structure of the roof for foundries and there are many who are convinced that they have discovered the one and only roof design that will give maximum light, ventilation and protection from weather.

Roof Design Is Important

We believe, however, that the design of a peak roof with a monitor on the top of it for ventilation purposes can be shown to be undesirable in the case of nonferrous foundries. Some special design roofs claimed to be free ventilators are not sufficiently effective in the case of nonferrous metals since the air that must be carried out of the building is laden with fumes from the vaporized metals. The moment the fumes are chilled they are driven to the floor and result in the presence of undue percentage of fumes at the level of the men where they will consequently breathe these fumes.

Consequently, the roof design should be such that a minimum chilling of the heated atmosphere is effected before that heated atmosphere passes out of the building. This means that the hot atmosphere must carry its burden of metal vapors and metal oxides up where it may be ejected through the ventilators, provided for the purpose, but the hot air and gases should not be permitted to travel any distance along the roof before they (*Please turn to page* 152)



Sketch indicating location of saw tooth roofs and ventilators

NATIONAL FOUNDERS

Study Business and Management Problems

A WELL rounded program bearing on legislative and economic aspects of general business as well as subjects of more specific interest including foundry management, developments in cast metals, and priorities was presented at the forty-fifth annual meeting of the National Founders' Association held at the Waldorf-Astoria hotel, New York, Nov. 12 and 13.

At the opening session W. D. Hamerstadt, Rockwood Mfg. Co., Indianapolis, and president of the association, outlined initial steps for ending labor dictatorship which he declared is not only hamstringing employers, but employes as well, and most importantly is retarding the country's defense effort. He suggested two measures: (1) Repeal the Wagner act and abolish the National Labor Relations Board, and (2) by federal and state laws declare the closed shop illegal with penalties on both employers and unions for conspiring to make membership in a union, a condition of employment.

W. D. Hamerstadt
Re-elected president, National Founders' Association

"The first business of today is to put our domestic house in order," said Phil S. Hanna, editor, *Chicago Journal of Commerce*, Chicago, in discussing various phases of the present emergency. "We cannot fight anybody long if we impoverish the citizen by ruinous taxes and let political hierarchy have laissez faire. We cannot have unity if the Supreme Court is to bend like reeds in the wind. Our farmers will not produce the food we need if we refuse to put currency on a sound basis."

Mr. Hanna emphasized the need for increasing the work-week all along the line and added that there is time enough to talk of a reduction of "butter," in favor of guns when every citizen is working a full six days a week. "Uncle Sam's self-sustaining income is from 'butter,'" he declared. "As 'butter' income goes down real national income goes down no matter how much we spend for defense."

Business and industrialists were severely castigated by George E. Sokolsky, author, columnist and industrial relations consultant, for failure to combat, lawfully and under the protection of the constitution, state and federal acts, measures and decisions which threaten their very economic existence indicating the great majority feared the political smearing of the few who have fought for tried and proved American principles.

Business and industry have been circumspect so long there has been retreat all along the line, Mr. Sokolsky expressing the view that there is no thorough thinking on a broad business and economic philosophy; both now face a taxation program for fostering government control of production and distribution under the cloak of preventing inflation.

Leo Wolman, professor of economics, Columbia University, New York, was somewhat less pessimistic in discussing American labor policy and its effect on industry, but indicated industry made a mistake in failing to oppose and resist vigorously some legislative enactments and their administration sooner. The great bulk of business must now make up its mind to fight for the integrity of the American economic system at a time when the country has gone ultra-politically minded in recent years.

Two paramount problems ahead are (1) wages and employment, (2) production. Prof. Wolman said high wages growing out of the last war and boom 20's, and held at peaks, contributed to sustained unemployment during the depressions, that even the brisk upturn in 1937 witnessed a 12 per cent unemployment rate. He predicted when tapering in spending (*Please turn to page* 130)

QUESTIONS and ANSWERS

Desires To Use Cylinder Blocks As Part of Cupola Charge

We understand that a number of foundries are using automobile cylinder blocks in the cupola charge in place of pig iron. We are using 40 per cent pig iron, silicon 2.65 per cent, sulphur 0.022 per cent, phosphorus 0.42 per cent, manganese 0.93 per cent. What per cent of pig iron could be eliminated if we still use 60 per cent of the usual scrap and the remainder of cylinder blocks and pig iron?

Automobile cylinder blocks show the following approximate analysis: Total carbon 3.30 per cent, silicon 2.10 per cent, sulphur 0.07 per cent, phosphorus 0.40 per cent, manganese 0.55 per cent, chromium 0.30 per cent, nickel 0.75 per cent. The charge contains from 15 to 25 per cent steel. Since iron loses from 20 to 25 points in the cupola, this iron will show a silicon content of only 1.85 to 1.90 per cent. That is too low for thin castings. So far as the silicon content is concerned automobile scrap is no better than the ordinary machinery scrap you are using at present. However, the pig iron may be reduced to a minimum in charges for thick heavy castings. For thin castings the silicon content in the ladle may be raised by the addition of crushed ferrosilicon or in the cupola by addition of ferrosilicon briquets. Also a small amount of silvery pig iron containing from 10 to 15 per cent silicon may be added to the cupola charge. Briefly stated, automobile cylinder blocks and miscellaneous scrap may be charged into the cupola provided suitable measures are taken to raise the silicon content to the point desired for the castings.

Discusses Permanent Molds for Making Aluminum Castings

We are interested in permanent molds for casting aluminum alloys, and would like to have all available information on the subject.

So far as we know little information has been published relative to the detailed procedure employed in production of permanent molds for ferrous or nonferrous metals. Incidentally such production is not an exact art since similar castings may be made by different firms in molds that vary considerably. Essentially the manufacture of permanent molds is based on long skill and experience. Molds may be made from plain gray iron possessing heat resisting properties or from alloy cast iron.

As a general rule the mold is about three times as thick as the casting section to be made. Gate section of the mold should be considerably heavier than appears necessary since permanent mold castings are sensitive to gate design, and ample thickness permits changes to be made without trouble. Design of the mold should be such that the resulting casting not only is sound, but that it may be removed easily from the mold.

Parting lines must be considered carefully from several viewpoints. First they tend to leave a slight flash, and therefore should be located so that they do not affect casting appearance. Second the parting lines act as vents, and location at corners, etc. will provide a good sharp impression on the casting at such points. Some times it may be advisable to make additional partings to facilitate making the mold—the separate parts being bolted together to form a single piece during use.

Hence, the mold may be in two or more pieces depending upon the shape and intricacy of the casting. Casting may be made completely in one part of the mold with the other part or parts acting as a cover plate; symmetrically about its center line so that one half of the impression and gate are cut in each side of the mold; the mold may be built up on a bedplate which may or may not form part of the casting; and the mold may be made with the impression cut almost entirely in a bedplate covered with one or more gate or runner blocks.

Separate parts of the mold must be doweled carefully to insure accurate location, and a locking arrangement must be provided which is adequate, and easy to operate. Contraction allowance for molds for aluminum alloys usually is about 0.10 per cent. To obtain good, sharp impressions it usually is necessary to provide more venting than available from the parting lines. Procedure is to cut shallow or narrow grooves on the joint face. While the grooves may reach to the cavity or impression, a better appearing casting is obtained if the grooves are stopped within 1/32-inch. They extend of course, to the outside of the mold. Grooves may be 5/16- inch wide and 1/32 to 1/16-inch deep, or just a few thousandths of an inch deep made by a small half-round file. Number of

such vents needed will have to be determined experimentally.

Gating may be through the thick section or through the thin section. Metal must be brought into the mold without turbulence, and usually the gates are curved. Arrangement so that the mold may be tilted during pouring will accomplish the same result. Gating may be at the top or from the bottom, but in the case of say tall hollow objects like pistons the gate should be narrow and extend along the side from top to bottom. A riser of similar size and shape should be on the opposite side. Gate should be large enough to fill the mold rapidly, but not so large that it and its junction with the casting remain molten after the remainder of the casting has solidified. In some cases like in that of the piston previously mentioned, it may be advisable to use more than one gate or gate and riser to insure uniform distribution of metal, adequate feeding, and eliminate local overheating of or formation of hot-spots in the mold. Those may result in low mold life due to cracking, warpage, etc.

In many instances where the mold thickness cannot be made with the proper relation to casting section thickness, cooling rates may be increased or decreased to some extent by chill inserts of copper which possesses greater thermal conductivity than cast iron, by making the mold hollow at certain points so that it may be water-cooled, or by painting the mold face with coating made of whiting, waterglass and a little graphite which acts as an insulator.

Those are just a few of the factors that must be considered in making permanent molds. There are some others such as design and location of cores to provide hollow portions, and they may be made of metal or of sand. Then there are mold and pouring temperature, selection of a suitable alloy for the castings, etc.

High Moisture in Molding Sand Results in Casting Scabs

Although the molds are vented thoroughly we find scabs in the corners of the bosses on the drag side and on the sides of a wedge shaped set gate on bronze pump impeller housings weighing from 12 to 75 pounds. The 88-10-2 mixture is poured at a temperature of 2000 degrees and the 80-10-10 metal is poured at a temperature of 1900 degrees Fahr. If the sand is at fault we shall appreciate your suggestion on the proper required characteristics.

From the evidence submitted, particularly reference to scabs on the sides of the set gate we are inclined to the opinion that your sand contains more moisture than necessary. In many instances only a narrow border line exists between the minimum and maximum moisture content which causes trouble. With other sands the spread is wider. In the first instance if the sand does not contain enough moisture it will cut and wash under the erosive action of the flowing stream of metal.

If it contains too much moisture the volume of steam is too great to escape readily in a direction away from the metal. The pressure also is raised to a point where it will lift portions of the crust. This condition is accentuated in pockets and in corners where the metal covers the vertical and horizontal faces of a body of sand at the same time. For example the corners around the housing bosses. The scabs on the set gate illustrate another condition. In addition to other characteristics, every sand has a definite resistance point.

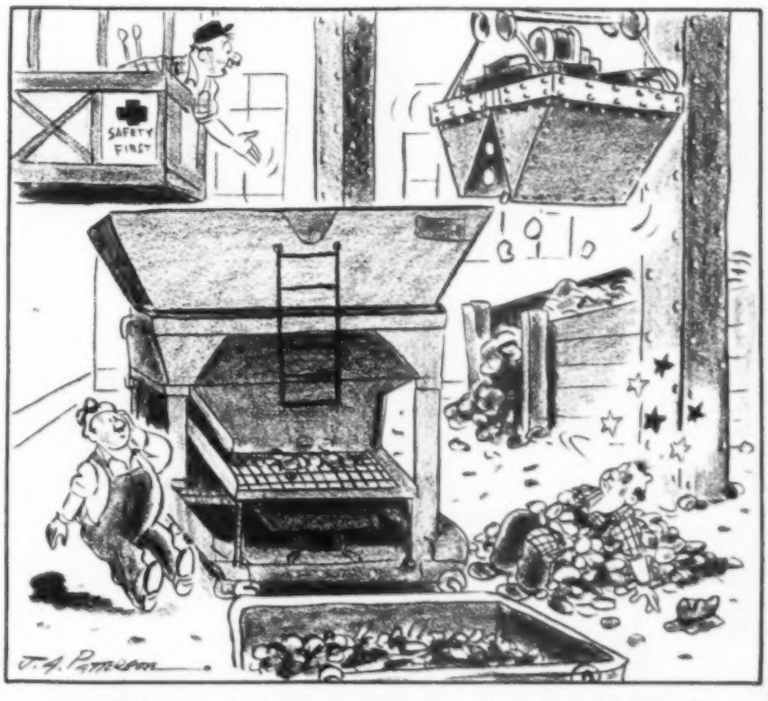
Thus a sand that will serve satisfactorily while 20 pounds of metal run over it, may disintegrate under a larger volume. Instead of using one main gate, it may be advisable to have the metal enter the mold through two or more smaller channels. Briefly, and on the assumption that your sand is satisfactory on other castings, we suggest working the sand drier on the housing, particularly around the bosses, and several branch or small pop gates instead of the single large set gate. According to A.F.A. standards a suitable sand for your purpose should show permeability 15, clay content from 10 to 15 per cent, green strength not less than 5 pounds and moisture between 6 and 7 per cent.

Wants Scrap Compositions Used In Cupola Raw Materials

In estimating the composition of cupola mixtures what is the average analysis assumed for (a) Open hearth steel scrap (b) steel rails and (c) railroad wheels. What is the loss or gain usually allowed for silicon, sulphur, manganese, phosphorus, chromium (briquets and ladle) and nickel in ladle.

In estimating a cupola charge the usual assumption is that miscellaneous steel scrap contains carbon 0.20 per cent, silicon 0.30 per cent, manganese 0.40 per cent, sulphur and phosphorus under 0.05 per cent. In steel rails the analysis is approximately the same with the exception that the carbon content is higher, from 0.80 to 1.00 per cent. On the car wheels we

GANGWAY! By J. A. Patterson



"You'll have to pardon me, Mr. Hapgood—I'm all thumbs today."

assume that you refer to cast iron wheels. Steel wheels rarely if ever turn up in the gray iron foundry scrap supply and then only if the foundry is equipped with an air or open hearth furnace. Cast iron wheels are made to very close and exacting specifications. The analysis varies to some slight extent depending on the size and weight of the wheel. A typical average analysis usually near enough for calculating a mixture will show: Total carbon not under 3.25 per cent, combined carbon not over 0.85 per cent, silicon 0.45 to 0.75 per cent, manganese 0.50 to 0.75 per cent, phosphorus not over 0.40 per cent, sulphur not over 0.14 per cent. The usual loss on silicon is 10 per cent. Sulphur gains 0.02 to 0.006 per cent, while manganese loss is about 30 per cent, and phosphorus shows a slight gain.

However, except in excessive amount, the phosphorus content is a minor factor. The loss of various alloys added either in the cupola or in the ladle depends a great deal on the knowledge and skill of the melter. Practically all the distributors of pig iron and alloys have charts and instructions dealing with the analysis of castings and the method of figuring heats. *Melting Iron in the Cupola*, by J. E. Hurst and published by the Penton Publishing Co., Cleveland covers all the features in connection with the construction, maintenance and operation of the cupola.

Has Trouble With New Sand Match

After we have made the mold for a hard sand match the frame is filled with sand bonded with linseed oil. A yellow powder is added which causes the sand to go through a heat. In use later this match sticks to the pattern and sand face surrounding it. We have used heavy parting, also fine sharp or beach sand, also fine burned sand from the cleaning room, but the match sticks unless the parting material is about $\frac{1}{8}$-inch thick and of course that will not do. We shall appreciate information on the proper mixture for a hard sand match, also what is the best material for parting.

From the evidence submitted we are inclined to the opinion that you are using too much oil in the mixture and that you are using the match before it is properly dried. Practically any liquid core binder may be used, but long custom favors linseed oil, or oils with a linseed base. They dry quick and hard. The sand is mixed with linseed oil and a small amount of litharge, say a handful to every 2 shovels of sand.

The sand is dried and a sufficient amount of oil added to make the mass workable. Some foundrymen prefer all new molding sand, while others use varying amounts of spent sand blast sand, dust from the tumbling barrels added to the new sand. The sand match will dry in about 24 hours and then is given a light coat of shellac. No parting is necessary on a properly made sand match. While hard sand matches or more properly speaking follow boards, have been used in the foundry and given fairly satisfactorily service over a period of many years, they are gradually passing out in favor of clay, plaster, or any one of the proprietary materials now on the market. Addresses of manufacturers of these materials appear in the advertising pages of THE FOUNDRY.

Steel Scrap Makes Hard Castings

We operate a foundry in Costa Rica and have a large quantity of wrought iron and steel scrap which we should like to use in a cupola charge. What is the highest percentage of this scrap that can be incorporated with cast iron to make satisfactory castings? We have tried several experimental castings for manholes and covers, from charges containing high percentages of wrought iron and steel scrap. They were exceedingly hard and also cracked when cold.

Metallurgy of cast iron is not simple. On the contrary it is one of the most complicated in the entire list of the arts and sciences. An average gray iron casting contains iron 93.50 per cent, carbon 3.30 per cent, silicon 2.00 per cent, sulphur 0.10 per cent, manganese 0.70 per cent and phosphorus 0.40 per cent. The carbon is present in two forms, namely combined and free or graphitic. Relative proportions of the two species govern to a great extent the hardness of the iron.

Silicon acts as a graphitizer. Amounts of the other elements determine the physical properties of the iron. All quite simple so far. In the melting process certain changes take place. Iron of a definite composition is thrown into the cupola and one differing in many respects is tapped from the breast. Thickness of the casting into which the iron is poured produces still further changes. Iron of a given composition poured into a thick casting will be gray and machinable. The same iron poured into a casting 1 inch thick will be too hard to machine. In a casting $\frac{1}{4}$-inch or less in thickness the same iron will be white, brittle and perfectly unmachinable.

Wrought iron and steel scrap contain practically no carbon. During the melting process the metal absorbs carbon from the fuel. With little or no silicon present, the carbon remains in the combined form and the castings are white and hard. Addition of ferrosilicon to the charge changes the composition and the iron can be produced with any degree of hardness.

Tuyeres Needed in A New Cupola

We have a cupola with a wind belt around the tuyere area of inches in diameter, 34-inch shell and 23 inches inside the lining. At present the cupola has six tuyere openings equally spaced. Before placing the cupola in operation we shall appreciate your opinion on the following points: 1—What size and how many tuyeres should we use? 2—We have a No. 7, 35-inch, and a No. 4, 24-inch, blower. Which one is the more practical to use? How many revolutions per minute should the blower run? 3—What horsepower motor is required? 4—Where should the bed be located and what is the best method for charging it? 5—What is the approximate melting capacity per hour for a cupola 23 inches inside diameter?

Size, shape and position of the tuyeres are relatively unimportant features in a small cupola. Instances are on record of little old-fashioned cupolas operating on one tuyere, a piece of canvas pipe with a cast iron nozzle. Your present arrangement will serve quite satisfactorily. The ideal tuyere is a practically continuous opening, but six tuyeres, even as small as 3 x 6 inches will form an almost continuous opening. The only important feature of the tuyeres is to admit a given volume of air at comparatively low pressure.

Your cupola has an approximate melting capacity of 1 ton per hour. This requires the admission of 30,000 feet of air per hour or 500 cubic feet per minute. 2 and 3—We have no data on the capacity of the fans to which you refer. We suggest you write the nearest branch office of the manufacturer. 4—For a fairly long heat the bed should extend about 48 inches above the tuyeres when burned through and ready for the iron charges.

About two-thirds of the coke is piled on the wood and lighted. The remainder is added gradually to keep the bed level. 5—The theoretical capacity of this cupola, based on the formula applicable to all large cupolas, 10 pounds per hour, per square inch of bottom area, is over 4000 pounds per hour. However, that rule does not hold on the smaller sizes.

★ ★ ★

NICKEL

Practical answers to many questions about the selection, fabrication and uses of Nickel alloys are quickly available to you. This helpful information we have gathered, checked and condensed into convenient printed form. It is useful both to experienced men handling new materials or performing unfamiliar operations... and to new employees. This literature is available upon request. You are also offered the assistance of our technical staff in solving material problems arising from a temporary lack of Nickel. Our engineers are offering timely suggestions to many vital industries during the present emergency. Your request for literature or personal consultation will receive our prompt attention.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

Is Melting Iron in Crucible Furnace

We are making tapping plates for copper reverberatory furnaces which are 2¾ x 12 x 12 inches containing a 2½-inch hole. The matte destroys them rapidly. We have tried three mixtures without any great degree of success. One contained 40 per cent pig (2.70 per cent silicon) and 60 per cent scrap iron with a resulting silicon of 2.15 per cent. Another was composed of 20 per cent pig, 40 per cent steel rail, 40 per cent scrap iron, and 1 per cent chromium. The third contained 20 per cent vanadium bearing pig and 80 per cent scrap iron. Second mixture was white and lasted about half as long as the other two. Taphole seems to burn out more rapidly when matte is high in sulphur and iron. We use a pit type, oil-fired crucible furnace for melting alloys for iron and steel, and have difficulty. Can you give us some advice?

Evidently the combination of high temperature and the sulphur in the matte is responsible for the short life of the tapping plates used in the furnace, and some experimental mixtures will have to be made to determine the most economical procedure on the basis of overall costs including lost time due to replacing the burnt plates. Possibly one of the high chromium alloy irons containing about 25 per cent chromium, 1.50 per cent silicon, and about 2.00 per cent total carbon might solve your problem, but we do not know whether you could produce such a composition successfully in an oil-fired crucible furnace.

Again, it may be that a gray fracture, alloy casting containing chromium to increase its heat resisting properties may work. You mention a 1 per cent chromium iron with a white fracture which was not successful. Calculation shows that the iron contained about 1.50 per cent silicon which with the chromium gave the white fracture. It is suggested that you try adding the same amount of chromium to the regular gray iron mix mentioned and see what results are obtained. If the fracture still remains white increase the silicon content to the proper point.

You do not mention just what your trouble with the oil-fired furnace is, but presumably it is either that the metal does not get hot enough for proper pouring of some castings, or slow melting, or perhaps both conditions at the same time. It is extremely difficult to make any long range diagnosis, and all we can do is make some suggestions. The first is to study your flame condition, and see that you are obtaining a short sharp flame as opposed to a long yellow flame indicating incomplete combustion. Perhaps the burner is too close to the furnace so that only the flame in the upper part of the furnace gives the maximum heat value—the lower part of the furnace acting as a combustion chamber.

That condition may be corrected by moving the burner away from the furnace and interposing a refractory tunnel between the two. The tunnel will act as a combustion chamber, mixing thoroughly the oil and air, and promoting combustion so that the hot gases are at the maximum temperature when they enter the furnace proper.

The burner should be arranged so that the flame enters the furnace at a tangent and swirls around the crucible. Instead of one burner you might try two—entering tangentially at opposite sides. You also might try preheating the air supply to the burner by passing the airline (properly protected by refractory) through the furnace stack. The oil also might be preheated, but naturally it could not be raised to as high a temperature as the air.

Damp Sand in Mold Causes Trouble

We are forwarding for your inspection a gray iron casting, 2.70 per cent silicon, *V*-shaped about 10 inches long. It is made from a loose pattern on a hand squeezer. The mold is rolled and the casting is poured with the heavy side, lugs and bosses in the cope. It is poured through two basins into four leaders, two on each side. We have been getting what looks like a cold shut on the thin section in the center between the lugs and bosses. On breaking some of these have found slight chilling. The sand has a permeability of 28 and moisture 8 to 9 per cent, green compression 4½ pounds per square inch. The iron is poured at an approximate temperature of 2700 degrees Fahr. We are wondering if the cause is improper feeding.

After examining the casting and taking all the available information into consideration we are inclined to the opinion that the thin areas on each side are caused by a combination of wet sand and hard ramming. On a casting of that shape and size the natural tendency on the molder's part is to work the sand on the damp side and ram a little harder than usual to keep all the hanging pockets in the cope from dropping. Silicon content of the iron is 2.70 per cent. It is poured at a temperature of 2700 degrees Fahr. In spite of these two factors the casting shows a hair line chill on a broken section, and a silent cold shut line at the top of the defective section.

These should not appear with normal sand moisture and normal ramming. The suggested remedy is to reduce the moisture content of the sand and to ram the sand not quite so hard. It is possible that the molder is using nails or soldiers to carry the hanging pockets. It is possible also that he is wetting the ends of these supports to an abnormal extent. Naturally, this will raise the moisture content of the sand in the vicinity. Iron flowing in from both ends heats the sand in these areas before the streams stop. In the center the streams meet and fill the remainder of the mold in a rather dead condition. There is just one more factor to be taken into consideration. If the cope weight sits flat on top of the mold, it may be interfering with the free escape of gas and steam. Scratch a number of channels on top of the sand before the weight is placed.

Cast Bronze Liners Centrifugally

We are considering the advisability of casting bronze liners centrifugally. These liners vary from 12 to 28 inches diameter, 14 to 30 inches in length and 1¼ to 1½ inches in wall thickness. Should the molds be horizontal or vertical? Should the molds be green or dry sand? Would cement bonded sand offer any advantage?

The liners you have in mind 14 to 28 inches diameter and 14 to 30 inches in length can be cast centrifugally either in a horizontal or vertical position. A good grade of refractory green sand will serve on the smaller sizes. On larger sizes it is advisable to apply a coat of blacking and either dry or skin dry the molds. The metal mold is pierced liberally with small vent holes to allow the escape of gas and steam. The mold is mounted inside a sheet metal casing to catch the flying jets.

By varying the thickness of the sand lining, each mold is available for making several sizes of castings. One end of the mold is closed and the other end is protected by a ring core or sand lined metal cap with a small hole in the center for the admission of the metal. The exact amount of metal is weighed or measured before it is poured into the mold. Vertical molds are clamped or bolted firmly to a revolving table running in ball bearings. Horizontal molds, carefully balanced for smooth operation, are mounted on roller bearings and driven by a belt around the center. Speed varies from 600 to 1000 revolutions per minute. This point can be determined only by experiment.

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TURNING out sound non-ferrous castings is easier than at first appears, when Truline* Binder is used in the cores. For Truline Binder is just the thing for those tough jobs in brass, bronze, aluminum, or magnesium alloys. The cores collapse so fast that there's little danger of core resistance causing shrinkage cracks.

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In all casting work, ferrous or non-ferrous (except for very heavy sections), you'll find Truline Binder is one good way to get more sound castings, faster at less cost. You'll find that sand is easily and quickly removed, saving a large part of the normal cleaning time. You'll find that shorter bakes are giving you more cores per oven per hour.

So, if you want to win medals for good castings, clip the coupon and send it along. We'll see that you get the facts about Truline, and a sample if you want it.

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SAVES TIME ON RAMMING Flowability of Truline Binder mix speeds ramming, particularly in green sand facings.

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JJ-45

MEN OF INDUSTRY

ERNEST R. STARKWEATHER has joined the Lufkin Foundry & Machine Co., Lufkin, Texas, as metallurgist. He was born in Ansonia, Conn., and received his early education there and in the schools of New Haven, Conn. He attended and graduated from Sheffield Scientific school, Yale University. He began his career with the Winchester Repeating Arms Co., New Haven, Conn., and was placed in charge of the physical testing laboratory. He held the position of metallurgist with the Colt Patent Fire Arms Co., Hartford, Conn., Farrel-Birmingham Co., Ansonia and Worthington Pump & Machinery Corp., Buffalo. Until his connection with the Lufkin company, Mr. Starkweather served as an inspector of naval material for the United States government.

♦ ♦ ♦

ROBERT M. GIBSON has been transferred from Koppers Co., Bartlett Hayward division, Baltimore, to the American Hammered Piston Ring division, Baltimore, as engineer. Mr. Gibson joined Koppers in 1923.

♦ ♦ ♦

OTTO A. SEYFERTH, president, West Michigan Steel Foundry Co., Muskegon, Mich., has been re-elected president of the Muskegon Chamber of Commerce.

♦ ♦ ♦

JOHN C. PHELAN has been re-elected president of the New Jersey Foundrymen's Association. Mr. Phelan, vice president, Benjamin Eastwood Co., Paterson, N. J., joined that company in 1900 and has been connected with it ever since. Prior to being elected president of the New Jersey association, Mr. Phelan served as vice president and as a director for many years. He was born in Ontario, Canada, and was educated at Canisius College, Buffalo.

♦ ♦ ♦

R. T. MANEELY recently has been appointed general manager, Hoffman Bronze & Aluminum Casting Co., Cleveland.

♦ ♦ ♦

DR. BRADLEY STOUGHTON, dean of engineering, Lehigh University, Bethlehem, Pa., was elected president, American Society for Metals, at its annual convention held recently in Philadelphia.

♦ ♦ ♦

EDWIN W. HORLEBEIN, president, Gibson & Kirk Co., Baltimore, has been re-elected chairman of the Chesapeake Chapter of the A. F. A. Mr. Horlebein was born and educated in Baltimore. Following graduation from Polytechnic High school, he became connected with the Baltimore & Ohio railroad as a machine apprentice and remained there until he entered artillery officers training school, Camp Zachary Taylor, Kentucky, where he was commissioned lieutenant in 1918. Following the war he joined the Dixie Mfg. Co., Baltimore, in the engineering department, and in 1924 became connected with the Gibson & Kirk Co.

♦ ♦ ♦

JAMES H. SMITH, formerly works manager, has been appointed general manager, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich. to succeed W. H. DOERFNER who has been made general manager of the corporation's Saginaw Steering Gear division, Saginaw. Mr. Doerfner has been associated with the General Motors Corp. for 23 years, being connected with Saginaw Malleable for 19 years. Mr. Smith was born in Jackson, Mich., and was educated in the public schools of Saginaw. He joined the General Motors Corp. in 1915 in the Buick Motor division, Flint, Mich., and was employed there until July, 1919, except for one year during which he served in the U. S. Army signal corps. He returned to Saginaw in August, 1919, and worked for the Saginaw Products Co. until December, 1930 when he transferred to Saginaw Malleable Iron division. Mr. Smith was appointed works manager of that plant in 1938.

SAMUEL W. HEALY, who has been assistant works manager, succeeds

(Concluded on page 74)

James H. Smith

Samuel W. Healy

Dr. Bradley Stoughton

Edwin W. Horlebein

Woodward

●●●▬

Uniform

PIG IRON

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

(*Continued from page 72*)

Mr. Smith as works manager. Mr. Healy is a native of Saginaw and attended the public schools of that city. He has been employed at the malleable division for the past 12 years, and for the past few years has been serving as assistant works manager.

FRENCH BASSETT, sales manager of the division, has been given the added duties as co-ordinator of the defense program for the malleable

French Bassett

division. Mr. Bassett joined Saginaw Malleable in 1918.

♦ ♦ ♦

ED JOCHUMSEN, manager of the Litchfield Mfg. Co., Waterloo, Iowa, has been elected president of the Northern Iowa Foundrymen's Association. Mr. Jochumsen was born in Cedar Falls, Iowa, July, 1903. He attended public schools in that city after which he entered Iowa State College, Ames, Iowa and later the University of Cincinnati, Cincinnati. For 8 years he was connected with the engineering department, John Deere Tractor Co., Waterloo, the last 3 years of which he was contact man between the engineering department and foundry. Mr. Jochumsen was assistant plant engineer, Rath Packing Co., Waterloo, for 2 years and then became a partner and manager, Harmon Foundry Co., Waterloo for 3 years. For the past 3 years he has been manager of the Litchfield company.

♦ ♦ ♦

EARL C. MAUND has become connected with Manning, Maxwell & Moore, Inc., Bridgeport, Conn., in its Chicago office, in a sales and engineering capacity.

♦ ♦ ♦

FRANK W. ROWE, general purchasing agent, Johns-Manville Corp., New York, for 23 years, is among the first to retire under the company's new retirement plan. Mr. Rowe, who is 72, joined the organization in 1914 after serving as a purchasing agent for General Electric Co. In 1937 he relinquished his post for reasons of health and became purchasing consultant.

♦ ♦ ♦

JOHN R. KEELER has been named to the technical staff of Battelle Memorial Institute, Columbus, O. Mr. Keeler is a graduate in chemistry, Indiana University, and formerly was associated with the International Smelting & Refining Co. He is a member of Phi Lambda Upsilon, honorary chemical society.

♦ ♦ ♦

J. F. ECKEL has been appointed supervisor of the General Electric Co.'s subcontracting program. In his new post, Mr. Eckel directs the company's subcontracting policies and practices as set up by company officials, handles relations with subcontractors as well as interested defense officials.

♦ ♦ ♦

JAMES C. DE HAVEN has been appointed to the technical staff, Battelle Memorial Institute, Columbus, O., where he has been assigned to foundry research. Mr. De Haven is a graduate of Dartmouth College and Carnegie Institute of Technology. Prior to joining the Battelle staff, he was associated for 6 years with the American Radiator & Standard Sanitary Corp., Pittsburgh.

♦ ♦ ♦

C. E. BALES, vice president, Iron Fire Brick Co., Ironton, O., was reelected president, Ohio Ceramic Industries Association at its recent annual meeting held at Ohio State University, Columbus, O. Other officers elected are: Harry D. Callahan, vice president; E. E. Hillyer, treasurer; and Prof. H. E. Nold, secretary.

♦ ♦ ♦

J. E. STRACHAN JR., Norton Co., Worcester, Mass., formerly of the Cincinnati territory has been assigned to the Pacific Northwest which includes Washington, Oregon, Idaho, Montana and Wyoming. He replaces A. M. PITTS, resigned. S. F. PRESCOTT of the Worcester sales engineering department becomes salesman for the Cincinnati territory. J. P. ENRIGHT, formely of the Chicago office staff, becomes field engineer for the Chicago district. WENDELL C. FORSMAN, sales engineering department, Worcester, has been appointed field engineer for Detroit and vicinity.

♦ ♦ ♦

FRED C. WOOD has been appointed manager of the air conditioning department, York Ice Machinery Corp., York, Pa. He will devote his attention to the application of industrial air conditioning to vital defense production. Mr. Wood was born in Hamilton, O. in 1905, was graduated with a degree in mechanical engineering from Cornell University and entered the York Ice Machinery Corp. as a student engineer in 1928. In 1931 he was transferred from York headquarters to the Westerlin & Campbell Co. which functions as a York branch in six Midwestern states.

♦ ♦ ♦

LEIGH WILLARD has resigned as president of Semet-Solvay Co., sub-

W. H. Doerfner

sidiary of Allied Chemical & Dye Corp., to become president, Interlake Iron Corp., Chicago. He succeeds FRANK ARMSTRONG who was named president of Interlake about a year ago, Mr. Armstrong returning to his varied industrial duties. ALBERG E. SCHERM, vice president, Semet-Solvay Co. has been named president to succeed Mr. Willard.

♦ ♦ ♦

JAMES H. WATTERS, until recently president and general manager, Marion Steam Shovel Co., Marion, O., has assumed the presidency of Union Asbestos & Rubber Co., Chicago, a post to which he was elected last month.

♦ ♦ ♦

HAROLD SINES VANCE, chairman of the board, Studebaker Corp., South Bend, Ind., has been elected to the board of trustees, Illinois Institute of Technology.

Builds Addition

Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland, is building an addition covering 4300 square feet floor space for enlarged manufacturing facilities.

"Standards for Safety in Electroplating Operations," has been made available by the American Standards Association, 29 West Thirty-ninth street, New York, at 30 cents a copy.

Molybdenum iron called upon to meet specially tough assignment

Truck transmission housings furnish a pointed example of the way the physical properties of Molybdenum irons dovetail into exacting special requirements.

The call here is for a material that assures uniform strength, and freedom from warpage or distortion in thin and varying sections, and a certain degree of rigidity to prevent harmful deflection under load.

These requirements are all being met, effectively and economically, by the use of a Chromium-Molybdenum-Nickel iron (0.70-0.80% Mo) which has an as cast tensile strength of 45,000 p.s.i., an average B.H.N. of 215 and, besides, is readily machineable.

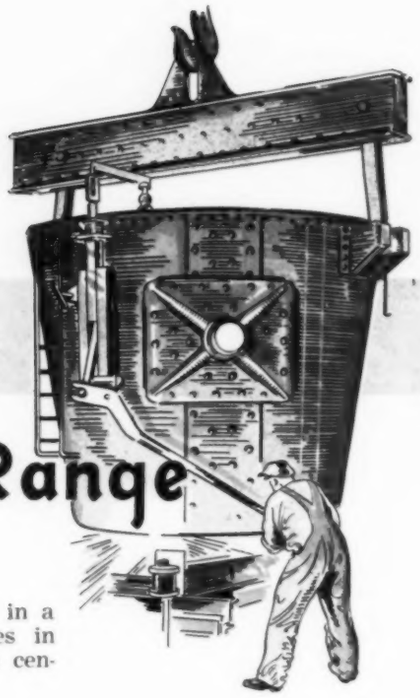
A re-examination of your own requirements in the light of modern developments in metallurgy may prove profitable. You will find our technical book, "Molybdenum in Cast Iron", helpful. It is sent free on request.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS. MOLYBDIC OXIDE BRIQUETTES FOR THE CUPOLA—FERROMOLYBDENUM FOR THE LADLE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

Foundry DEVELOPMENTS At Short Range



THOUGHTLESSNESS is the cause of many industrial mishaps, and the following from a report of an accident in an Ohio foundry illustrates it clearly. The foundry is located in a low section where water collects after a heavy rain. On such an occasion when the cupola was in operation the water came up over the floor, and the men hastened to pour off the heat; even wearing boots to accomplish it. When the cupola was emptied, one of the men dropped the bottom as usual. As soon as the mixture of coke, slag and some iron struck the water the inevitable happened. Fortunately, no one was even slightly injured, but the exploding material went through the roof and did considerable damage to the cupola.

* * *

A producer of cast, acid-resistant, high-silicon pipe ran into difficulty in shipping due to its brittle nature. Especial care in packing was necessary so crating engineers developed a special, wire-bound box for transportation. The pipes are 5 to 6 feet long, and 2, 4 and 5 inches in diameter. The boxes contain three intermediate cleats with circular-sawn channel pieces which fit snugly and entirely around each pipe. Boxes carry one, two, four and eight pipes, depending upon the size.

* * *

A core sand mixture that stands up in service and then runs freely from a steel shell casting 40 inches in length, 13 inches diameter and a metal thickness of 1 inch, contains per batch: 1300 pounds silica sand, 300 pounds silica flour, core oil 1 to 28 by volume, or 1 to 43 by weight and water 7½ gallons. The core weighing 175 pounds is blown on a core blowing machine and is claimed to be the largest core made in that manner up to the present. It contains no rods, arbors or any other form of reinforcement. The core is dried horizontally in a dryer shell. A vent 2 inches in diameter extends through the center.

* * *

Concentration of phosphorus on the surfaces of little air pockets or blow-holes in iron and steel recently has been proved by using radioactive tracers according to an investigation at Westinghouse Electric & Mfg. Co. research department. The phosphorus used in the experiments was made artificially radioactive by bombardment in an atom-smasher. The rays do not affect the phosphorus, but invests it with invisible rays like those of radium. A sample batch of steel was melted to which was added the radioactive phosphorus. The steel when cooled was placed between photographic film. The developed film revealed blotches caused by the rays from the phosphorus tracers. Light areas on the print corresponded with blowholes in the steel indicating that the phosphorus had concentrated on the surfaces of the holes.

* * *

IN A Canadian steel foundry where the flask parts are approximately 4 feet square and 2 feet deep, a superior type sling has been developed for rolling the flasks on their trunnions. The sling to a certain extent resembles an engine connecting rod. One end is attached to the end of the beam suspended from the crane hook. The other or lower end is formed into a ring with the opening considerably larger than the end of the trunnion. A second ring inside the first is mounted on ball bearings. When these slings engage the trunnions on the flask it may be rolled over with scarcely any effort. The trunnions of course are located at points corresponding to a line drawn through the center of gravity.

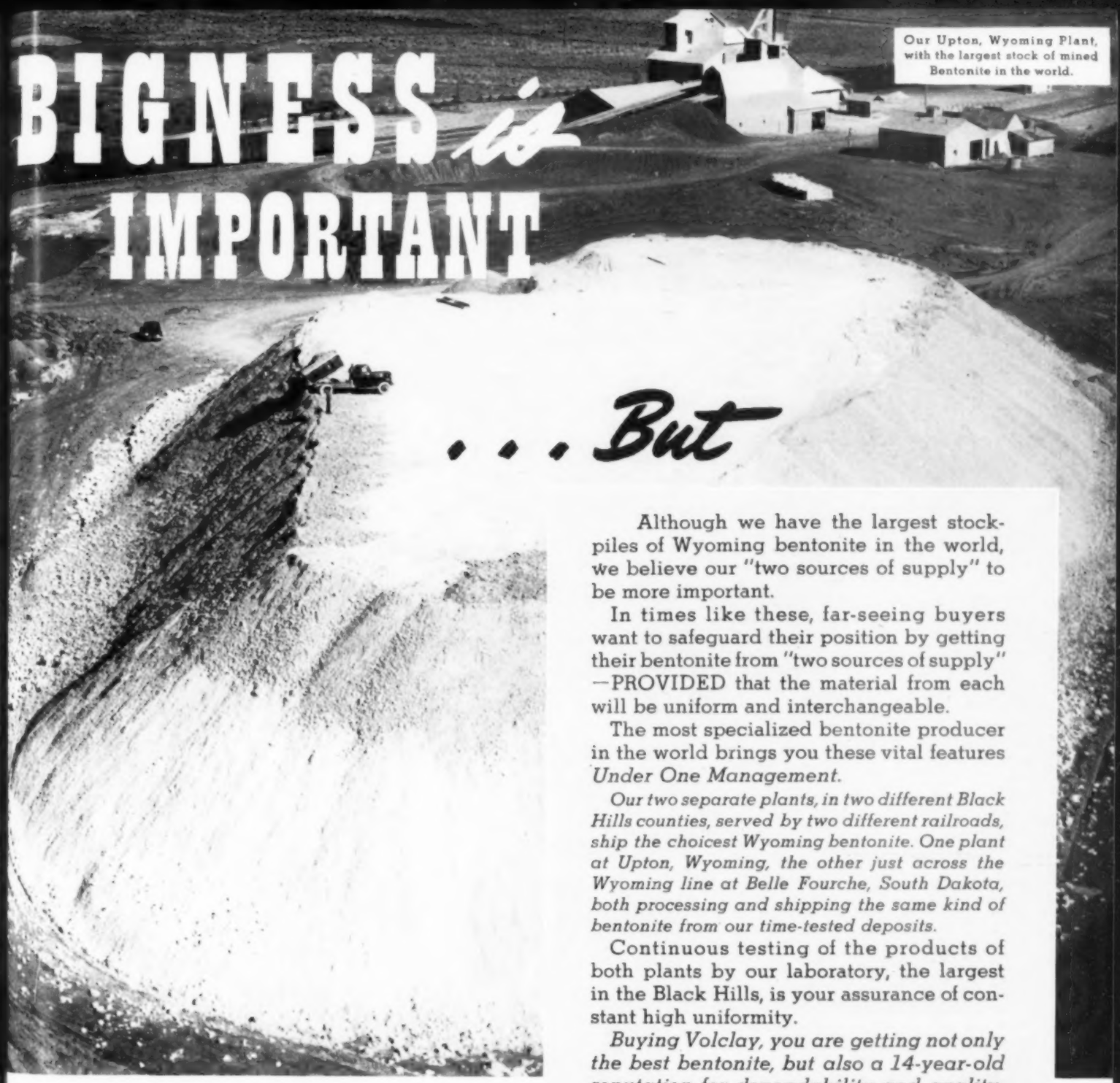
* * *

One firm uses cotton industrial bags such as used for parts mailing, to group sub-assemblies which are sent to the main assembly line. Related parts such as lock washers, nuts, cotter pins, lugs, fittings and light machinery parts are placed in a bag or small group of bags, in the stockroom. The paper tag which is sewed into the bottom seam of the bag is marked for quick identification, and the bags are held in the stockroom until needed. As the equipment being assembled moves down the line to where the parts will be needed, the bags of parts are sent to the proper station. Considerable time and labor are said to be saved on the assembly floor because all the necessary parts in the bags are available and easily accessible.

* * *

SPINNING heavy metal wheels in a vacuum at speeds up to 1000 revolutions per minute, scientists at General Electric Research Laboratory at Schenectady, N. Y., are making a pound-mass exert a pull of over 100 tons, by centrifugal force. The wheels are rotors for turbosuperchargers for high-altitude airplanes and travel at high speed exerting a pull of more than 50 tons at the periphery. Use of a vacuum chamber decreases horsepower required to drive the wheels, and permits employment of a varnish coating to reveal stress cracks at speeds below which the wheels will break. Fragments from rotors which break have as much energy as projectiles fired from small naval guns which can penetrate several inches of armor plate. Hence, the walls of the vacuum chamber are massive, and sometimes are lined with lead bricks. The lead bricks serve to minimize the impact damage to the fragments of the rotor.

BIGNESS *is* IMPORTANT



Our Upton, Wyoming Plant, with the largest stock of mined Bentonite in the world.

. . . But

Although we have the largest stockpiles of Wyoming bentonite in the world, we believe our "two sources of supply" to be more important.

In times like these, far-seeing buyers want to safeguard their position by getting their bentonite from "two sources of supply" —PROVIDED that the material from each will be uniform and interchangeable.

The most specialized bentonite producer in the world brings you these vital features *Under One Management.*

Our two separate plants, in two different Black Hills counties, served by two different railroads, ship the choicest Wyoming bentonite. One plant at Upton, Wyoming, the other just across the Wyoming line at Belle Fourche, South Dakota, both processing and shipping the same kind of bentonite from our time-tested deposits.

Continuous testing of the products of both plants by our laboratory, the largest in the Black Hills, is your assurance of constant high uniformity.

Buying Volclay, you are getting not only the best bentonite, but also a 14-year-old reputation for dependability and quality.

VOLCLAY *Bentonite*

AMERICAN COLLOID COMPANY • CHICAGO

Belle Fourche, South Dakota, Plant

THE ADVENTURES OF BILL

BY PAT DWYER Drawings By RICHEY

WHILE a wild northeaster blew in from the lake and threatened at times to pick the house up bodily and give us a new post office address, Bill and I sat for an hour in front of a cheerful fire in the grate. Bill said nothing—he was reading the evening paper—while I sat slumped in a chair doing absolutely nothing. The slight effort involved in scratching a match now and again and in sucking a fairly steady volume of smoke through the stem of an old cob pipe, would puzzle even the cutest government analytical expert to classify as work. The further slight effort involved in knocking out the ashes now and again and pushing a fresh charge of tobacco into the magazine is the nearest approach of which I am aware to perfect automatic action.

The quiet and peaceable seance was broken when Bill folded the paper and threw it on the fire.

"Some of the items are interesting," he said, "but I don't know why I waste time reading the other columns. Every paper I pick up reports the destruction of millions of men over in Europe. Each side claims the loss of 14 intrepid heroes in each action while the enemies' loss is 300,000 casualties and 200,000 prisoners. If one was to add up all the battle figures for the past year he could not escape the inevitable conclusion that the casualties exceed the entire male population and that the prisoners on both sides are the only unfortunate victims left hanging on to the string of life. Who is going to feed 'em? The ravens?

"Other items that give me the greatest pain are those flamboyant descriptions of the courtship and marriage and subsequent divorce inside a few days or weeks of people who never did and never will contribute a scintilla of evidence to justify their existence—"

"Hesitate my dear boy," I said. "Place one foot carefully after the other. You are stepping on a slippery slide. The evidence apparently all may lie on one side, but sometimes there is a joker in the deck. I am old fashioned enough to view these hurry up divorces with a fishy eye, but I don't lose sleep or run a temperature over them. Two high spirited and pampered young creatures find that marriage interferes with their perfect freedom or license of action. Human butterflies, they flit from flower to flower. They are free, white and—for legal purposes—over 21—and they invoke the law of the land for which they have neither knowledge nor respect to untie the knot. They just kinda turn sour on each other."

"What do you mean, turn sour? You mean that the milk of human kindness goes into a tail spin down the chute the first morning the toast is burned?"

Lives by himself and likes it

"Did you ever read one of the late O. Henry stories about the two trappers who spent a winter together in a small snow bound cabin in the high Rockies?"

"No, I can't say as I did. What was this fella Henry's other name? I worked up in Denver one time with a fella named Henry Q. Kilroy. We always called him Curly Cue except when some nice point of shop etiquet brought the rammers and shovels into play. A nice little dose of oil could be thrown on the flame by addressing him and referring to him in a loud, clear voice as the Pig's Tail.

"I had a letter recently from an old friend of mine cut in that Rocky Mountain country. I generally hear from him about this time of the year. I think he holes up like a bear for the winter and that gives him a chance to catch up on his correspondence. Appropriately enough he begins his letter with a comment on frozen molds."

"Do you or don't you want to hear about the two sour trappers?"

"No. I know too many sour pusses now. Why should I add to the collection?"

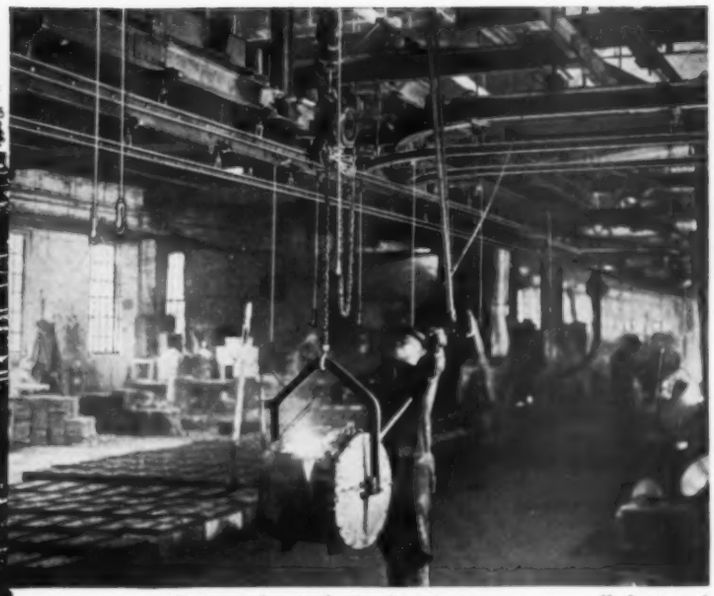
"Spoken like a true patriot, Don't Give Up The Ship, Remember The Alamo and Where Do We Go From Here? I won't tell you the whole story. Just enough to illustrate the point that very small things can turn friends into bitter enemies. Fine weather in the fall tempted the two trappers to prolong their stay beyond the usual date. One morning they woke up to find the cabin and all the surrounding country covered with snow to a depth that prevented all travel. For the first two weeks the two lads enjoyed conditions thoroughly. Then each one gradually became highly critical of and disgusted with the other. By the time spring arrived they were about as friendly as a pair of winter starved wild cats simultaneously spotting a bit of provender at rest or on the hoof. All brought about, if you please, through constant and intimate association. With his truly remarkable skill Mr. Henry brings the tale to the happy and unexpected ending for which he was famous."

"This mountain man in his letter refers very kindly to THE FOUNDRY and to a book you wrote several years ago under the title *Tales From The Gangway*. Of course if you do not want to hear the message—"

"I often wonder where you get such quaint notions. As I have remarked to you on many occasions, in fact I might say invariably I have expressed the keenest delight

(*Continued on page* 80)

AMERICAN MONORAIL *Relieves* "PRODUCTION JITTERS"



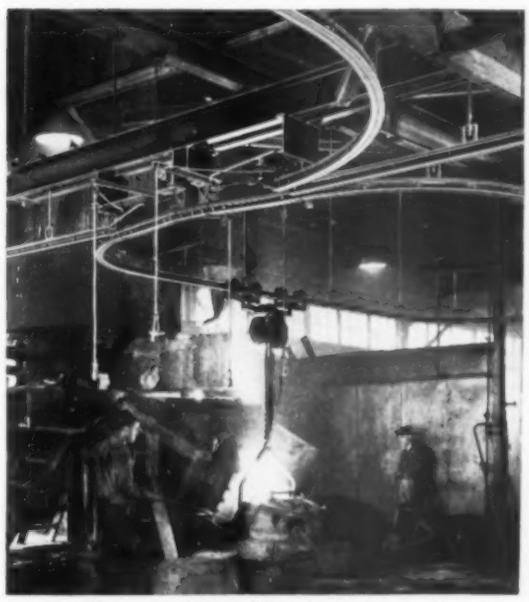
Hot metal gets faster distribution over a well designed MonoRail System.

AMERICAN MONORAIL
OVERHEAD HANDLING EQUIPMENT

"HIGH re-handling costs through process" — "Production tied up by floor congestion" — "Too much handling by skilled labor" — these and many other "production jitters" are being easily and quickly "cured."

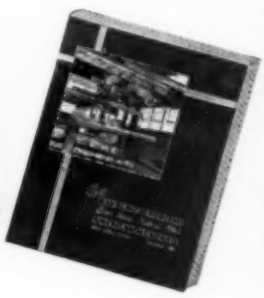
The American MonoRail Engineer has the right prescription for putting production on an efficient basis.

Whatever your handling problem may be, it will pay you to talk with an American MonoRail Engineer. He will explain the benefits of American MonoRail Overhead Handling Equipment particularly suited to your individual problem.



Greater safety and less lost time result from MonoRail tapping loops.

Send for copy of Blue Book. See the American MonoRail Engineer Immediately. →



Easy rolling trolleys on overhead MonoRail assure accurate pouring.

The American MonoRail Co.

13104 Athens Avenue · · Cleveland, Ohio

(*Continued from page* 78)

in hearing or reading the sage remarks from the boys out on the firing line. They are not hampered by any of the usual rules covering spelling, grammar or composition, therefore the message has the real genuine ring to it. Just a moment while I adjust the old puss to register the most intense interest in and appreciation of this burning message from the rocky pinnacles of the high Sierras. Some of these hermit lads, when given the opportunity can swing the bat with quite commendable skill."

"Swing the bat, hey? That does sound better than the old foundry term. Your insistent demand to hear this letter reminds me of an old colored helper I had one time in New Orleans. He was something like that guy Aladdin. Whenever he rubbed a lamp or a ring or something a Jeanie or a Jenny appeared with any desired object. Needless to say I am not referring to Jeanie with the light brown hair worn to a frazzle this past few months on the radio—"

"Come, come my good man. The letter."

"Oh, the letter. As I was saying this helper Joe—did I tell you his name was Joe—I don't believe he had any last name—something like a mule—well any way Joe prefaced all his questions with 'Is you is, or is you ain't' going to do so and so. For example when the time came to lift a cope he had the crane spotted with the chains dangling over the center irrespective of how many other men were clamoring for service. Then he would calmly inquire 'Is you is Mistah Bill, or is you ain't goin' to roll 'er over or set 'er up on hawses?' By the way, I wonder why four barrels with a couple of rails on top are always referred to in the foundry as horses."

"I would not know. Foundrymen have a curious vocabulary of their own. I have it on reasonably good authority that they sometimes drag horses in sections into the conversation, especially when discussing the shortcomings of competitors and of any other people who dilly-daddle and beat about the bush even in the most trifling affairs. The letter, probably unreadable by this time, rolled up in a hip pocket and stained with sand, sweat and tobacco juice, does not interest me to any extent. However, if you are aching to read it, why common politeness, the sacred laws of hospitality and-er—all that kind of stuff, compel me to listen. You may shoot when ready Gridley."

"Shoot who? And where does this Gridley guy come in? This message is as calm and peaceful as the news we shall receive from the battle front around the Christmas season when the opposing troops fraternize on no man's land and join in singing *Holy night, silent night*, the sweetest, gentlest and most melodious composition, words and music, in any language."

"If the transmission of the news was left to you, a description of this touching fraternal incident would not appear until the following July or August. For the last time is you is or is you ain't going to read the letter?"

"Silence 'tween decks! Here she comes:"

Dear Bill: I read in THE FOUNDRY some weeks ago about where in Russia they freeze molds and green sand cores on purpose. I have seen a lot of frozen molds in barn like shops up and down the Rockies, but we always tried to prevent this condition by setting a salamander in the gangway or covering them with sacks the night before the heat day. Personally I never could see where a frozen mold was very bad to pour. It always was a good alibi when a grate bar or car wheel kicked or turned out to be a waster. What do you think, Bill, are the general run of molds harmed by freezing? I ask the question in all sincerity. Any way it is no more simple and elementary than some of the questions published on the question and answer pages of THE FOUNDRY. Some of these birds should be in a doughnut foundry where they could eat the bad ones.

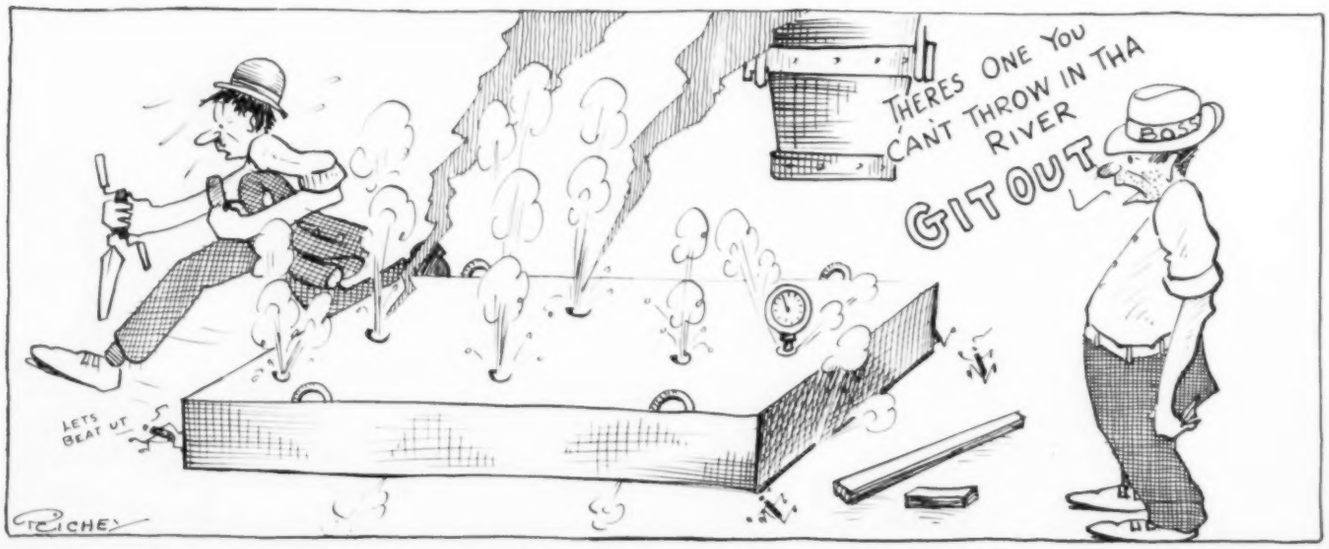
Speaking of frozen molds reminds me of two hoboes who worked one winter with me in a shop up the line. We were covering the sand and molds one cold night and the process reminded Moses—first and only molder I ever knew by that name—no relation to the kid in the bull rushes—the process reminded Moses of a shop in Milwaukee. The cold was so intense in this shop, they had to pour gasoline over the sand in the morning and set fire to it, instead of peeling off the frozen crust and banking it around the salamander as we were doing.

The rest room for this Milwaukee shop, a modest establishment, fully air conditioned and equipped with open plumbing over hung the river. It was erected according to one of the early designs of the late Chic Sale and at a time before his creative genius and manual dexterity had fully flowered. The 2 x 4 scantling even when planed on the upper side left much to be desired.

Boys suffering from slight doubts about certain castings got in the habit of coming in early to the shop to root the castings out of the sand. Any wasters discovered in this manner were taken to the little cot in the vale and dropped into the river.

Ed, the other old hobo said, 'Yeh, Mose, we know you are a regular Bobby Dazzle. How about telling the lads about the monument you left in Milwaukee. He was working in a pit under the hook and he leaves part of the pattern in the mold. Before the mold was half filled she commenced to blow and set all the ceiling cobwebs and beams on fire. He grabbed his hat and coat, his trowel and double ender

(*Concluded on page* 122)



The time has come to think of pigs and ships and sealing wax and he wishes he had wings

M. W. ZEMAN

RECORD: Joined Osborn in 1911 as a machine designer. Today, serves in a joint capacity as Director of Sales and Engineering.

Tradition Blasted

and Bomb Production Hit a New High

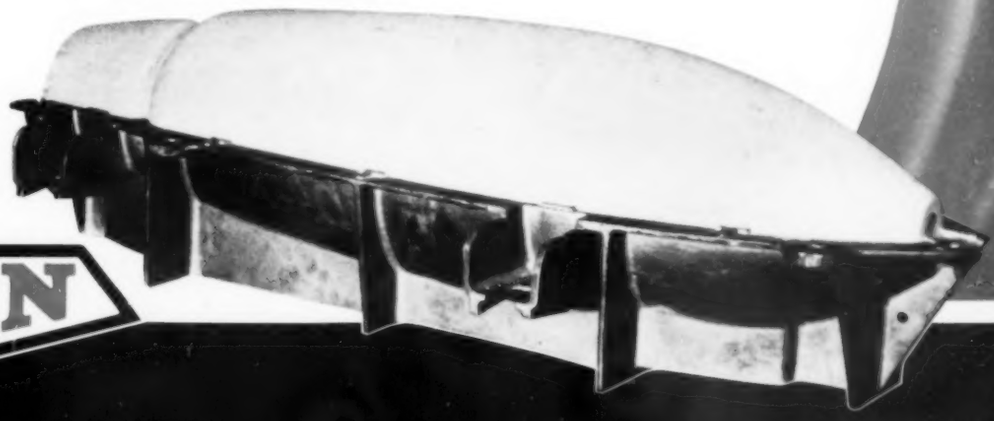
• During his 30 years of service with Osborn, M. W. Zeman has pioneered many developments in moulding and core blowing machine design and construction. His experience is world wide because, as managing director of Osborn's European activities, he has observed modern foundry practices in many countries and, in recent years, studied their application to present-day armament production.

That's why Electric Steels, Ltd., of Canada, which is producing 500-lb. General Purpose High Explosive Bombs exclusively, brought a core blowing problem to Osborn that had no precedent in the foundry industry. How Osborn engineers, under Mr. Zeman's direction, not only met but exceeded this company's requirements is described on the next page. If you have a production problem involving moulding or core blowing machines, it will pay you to contact Osborn at once.

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue • Cleveland, Ohio

This Bomb Body Core blown for the 500-lb. General Purpose High Explosive Bomb.



OSBORN

MOULDING AND CORE MACHINES

Mass Production of 500-lb. Bomb Body Cores Made Possible by the Development of an *Osborn* Core Blower

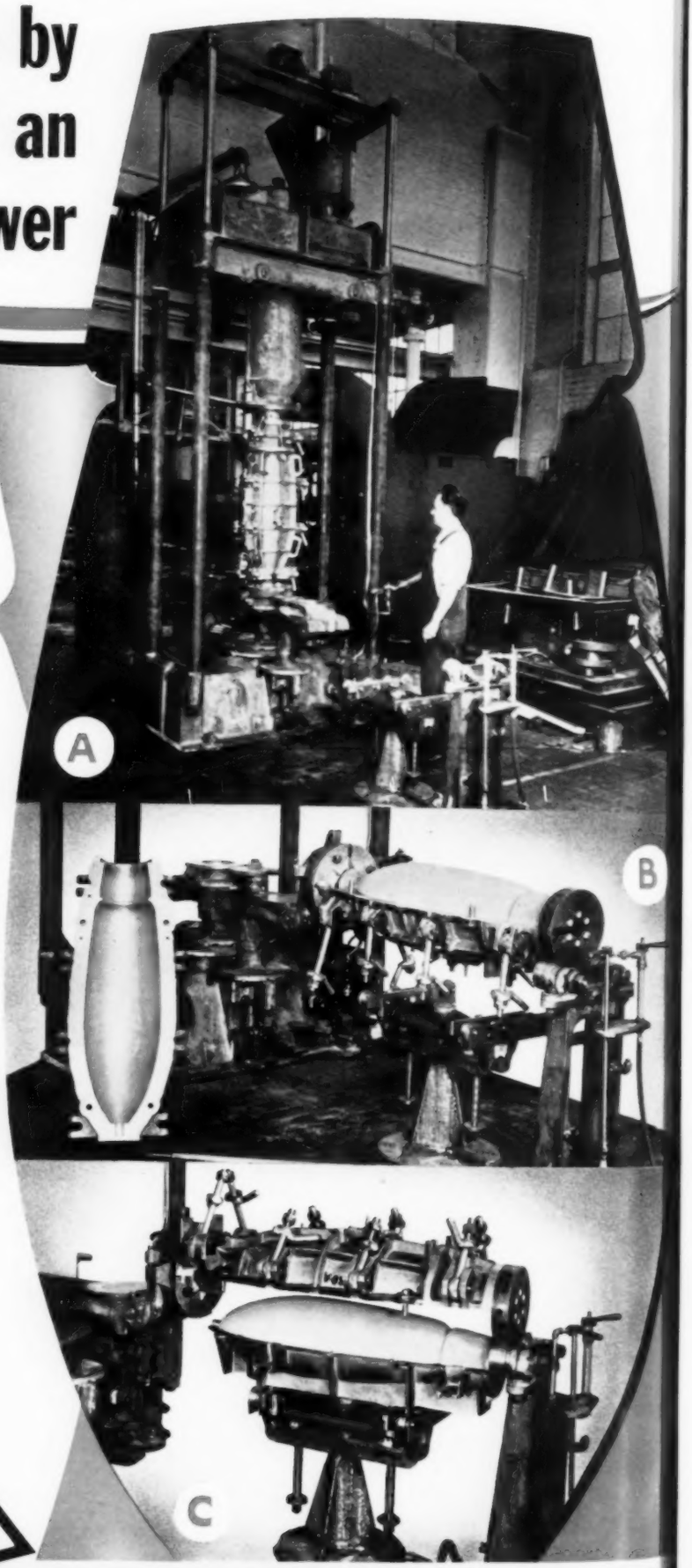
THE new and modern plant of Electric Steels, Ltd., at Cap de la Madeleine, Quebec, is manufacturing 500-lb. General Purpose High Explosive Bombs exclusively. Initial production schedules called for 20 bomb body cores per hour. This requirement presented a stiff assignment under existing methods. A core blowing machine was the logical answer, but none was available for blowing cores of this size and type.

Osborn accepted the assignment and, working in cooperation with Electric Steels, Ltd., developed the new No. 2034 Core Blower illustrated at right. According to the owners, this unit has well exceeded the original schedule and is now approaching 45 cores per hour.

Based on this unit's highly satisfactory performance, it seems reasonable that the No. 2034 will be enlarged to produce Bomb Body Cores for the larger and heavier bombs. Further information on this newest Osborn Core Blowing Machine is available on request.

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue • Cleveland, Ohio



A *Full view of the No. 2034 Core Blowing Machine, together with Core Drawing Mechanism and Rollover Support Stand.*

B *View shows equipment after the Core has been blown, the box rotated to the "draw" position and swung down onto the Rollover Support Stand.*

C *Operation after the Core Box with Drier has been rolled over and drawn by the Core Drawing Machine. Completed core is shown in drier, resting on rollers ready for transfer to the drying ovens.*

OSBORN

MOULDING AND CORE MACHINES

By A. H. ALLEN
Detroit Editor, The Foundry

AMONG DETROIT FOUNDRIES

TERMINATION of a lengthy and successful period of activity in the foundry industry was marked last month by the transfer of W. H. "Bud" Doerfner from the general managership of the Saginaw Malleable division of General Motors to a similar post with the Saginaw Steering Gear division, both in Saginaw, Mich. Mr. Doerfner has been an aggressive participant in affairs of the American Foundrymen's Association and his departure to new fields will be a keen loss. He was an executive who was never satisfied with the old and established order of things and was always the exponent of new ideas in techniques and materials.

Proof of this is the important expansion of production at the Saginaw Malleable division, the introduction and application of the graphitic steel known as Arma-Steel in the period when Mr. Doerfner held the reins. He is a native of Saginaw and has been associated with General Motors since 1918. Only three years ago he was elevated from works manager to general manager. As manager of the steering gear division, which holds large contracts for .30-caliber Browning machine guns, as well as for the supply of machined and assembled steering gear units for all General Motors models, he succeeds Alva W. Phelps who has been transferred to LaGrange, Ill., as assistant general manager of GM's diesel locomotive division there.

Several Executives Promoted

James H. Smith, works manager of the malleable division, moves up to the post vacated by Mr. Doerfner, and Samuel W. Healy, assistant works manager, succeeds Mr. Smith. Associated with GM for 26 years, originally at Buick, Mr. Smith has been with the malleable division for 21 of these years and three years ago was appointed works manager.

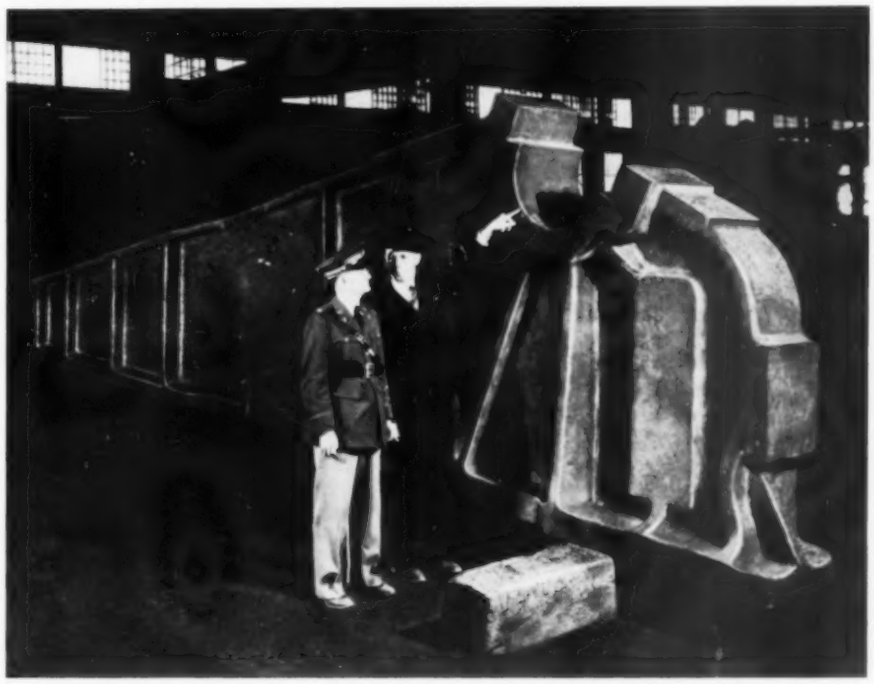
French Bassett, sales manager of the malleable iron division, has been assigned added duties as co-ordinator of the defense program for the division. This is a steadily increasing tonnage and there are prospects for considerable more business of a defense nature, probably some type of large-caliber shell.

Graphitic steel was adopted at the last minute for Oldsmobile pistons in 1942 models, after cancellation of original plans to use conventional type of gray cast iron. The steel, averaging about 40 per cent heavier than the same piston in aluminum, obviates the necessity for strengthening up connecting rods and rod bearings particularly in 8-cylinder engines, and while there was some strengthening of the Olds 8 engine, the design change was put through before it was decided to use Arma-Steel pistons. Engineers report that pistons up to 50 per cent heavier than previous types can be accommodated without the necessity for major motor changes.

At the recent National Metal Congress in Philadelphia, H. S. Austin of the Buick Motor Division foundry, spoke briefly on the current situation in the motor company foundries. He reported production about 65 per cent of capacity and said that, with the exception of nickel, the matter of ferroalloys was not particularly critical, although a good many shifts in sources for material have been necessary.

He noted that the shortage of silvery pig iron tended to make the problem of silicon a cause for some concern, silicon being essential in gray iron. Inasmuch as scrap metal in charges currently is running from 10 to 60 per cent, and 10 per cent silicon loss is incurred during melting, the alloy must be added to foundry melts. One way of avoiding melting losses is to make ladle additions of ferrosilicon or briquetted silicon carbide. Mr. Austin mentioned the development of high-phosphorus titanium alloy iron and pearlitic malleable iron as suitable alternates for gray iron.

Considerably lower motor foundry outputs are undeniably ahead as the rate of motor car production is



Major G. H. Knode, chief of artillery inspection, Pittsburgh ordnance district, and J. R. Patterson, vice president, Mackintosh-Hemphill Co., are shown inspecting a side frame section for a 16-inch coast defense gun at the firm's Midland, Pa., plant. All the mounting sections are cast here, 10 pieces per gun including side frames like the one shown above. Together they weigh 420,000 pounds. When the gun is mounted on them, the total weight is 702,000 pounds, enough steel to make approximately 350 autos, or 31,000 refrigerators or 4600 washing machines

further curtailed. There are some who foresee almost total suspension of passenger car production some time next year which would result in a fairly complete blackout in foundry operations, since, as K. T. Keller recently pointed out concerning the Dodge Foundry, "we have 1200 in our gray iron foundry, for which so far we have no defense work."

Truck production, of course, will continue in high gear and plans have now been drawn up for the release of additional 1942 army truck requirements, covering an estimated 25,000 more vehicles than those now on order. But at best truck production is only a drop in the bucket compared with normal passenger car production, and the impending curtailment of motor car foundry operations is likely to be of major proportions.

According to employe transfer plans now worked out by the leading motor companies, a man can transfer to a plant doing defense work without giving up his seniority in his original job. However, should his original employer take on defense work he has the option of recalling transferred men to their former posts.

Provides Additional Facilities

Midwest Foundry Co., Coldwater, Mich., is erecting an addition to its plant to provide additional molding facilities required by defense orders. The addition will comprise eight molding bays, each of which will accommodate between 200 and 300 additional molds per day. The expansion is estimated by officials to increase the foundry's daily melt by about 25 per cent from the present daily maximum of 40 tons of gray iron. Two cupolas are operated.

Pontiac foundry is operating at somewhat better level than most of the large automotive foundries, primarily due to large banks of orders for truck castings. Early in November, daily average was about 600 tons of iron a day, against actual capacity of 750 tons. A number of new equipment installations are in process, including new coreblowing machinery, equipment for batching of core ingredients by weight as well as some new conveyor systems.

Engineers have worked some new ideas in handling maintenance materials and supplies, such as brick, clay and the like. Brick, for example, are stacked on wood pallets as they are shipped from the supplier's plant in freight cars. The pallets are lifted out of cars and into storage by high-lift inclined fork trucks, and likewise are moved from storage to point of use the same way, saving considerable time and effort over former manual handling systems.

Synchronized conveyor system installed at Pontiac at the cylinder block pouring station is still the admiration of visitors. Pouring ladle on an overhead monorail, operator on a moving tread conveyor, and molds on a power conveyor are all synchronized to the same speed, so that the operator does not need to push or pull his ladle to keep it spotted over the mold. In addition, a battery of powerful exhaust fans behind the pouring station keeps the air in the vicinity as clean as that in a research laboratory, in sharp contrast with many pouring departments.

Another recently completed installation is a core sand dryer similar to that installed in the Buick foundry. Sand is transferred from cars to the rotating dryer drum where it is uniformly dried and aerated before being conveyed to storage. About 350 tons of this sand can be stored.

Foundry Equipment Makers Meet

Major attention was given to the subject of priorities at the twenty-third annual meeting of the Foundry Equipment Manufacturers' Association held on October 24 and 25, the Greenbrier hotel, White Sulphur Springs, W. Va. In his opening remarks, P. J. Potter, president of the association, emphasized the responsibility of the industry to the defense program; this responsibility being due to the fact that equipment for foundries is fundamental to practically all metal working industries.

The informal discussion during the first session related principally to methods of operation under the industry's preference rating order. Frank G. Steinebach, chief, Foundry Equipment and Supplies Unit, Tools and Equipment Section, Office of Production Management, participated in this discussion.

An address on October 25 by Dr. E. E. Pratt, regional co-ordinator, Office of Production Management, conveyed to the members of the industry a broad understanding of the operation of the priorities system. Dr. Pratt discussed this subject from the following standpoints: (1) Why we have priorities; (2) How do they operate?; (3) What is likely to be the future development in priorities?; and (4) What are some of the guiding principles of priorities? By taking this broad general outline of the priorities system and relating to it the details of operation under the industry's preference rating order as discussed at the preceding session, the members will be enabled to administer their individual operations even more efficiently in relation to the defense program.

New directors elected at the meeting were, W. L. Dean, Mathews Conveyer Co., Ellwood City, Pa.; P. J. Potter, Pangborn Corp., Hagerstown, Md., and O. C. Sabin, Steelblast Abrasives Co., Cleveland. Other directors are, E. O. Beardsley, Beardsley & Piper Co., Chicago; R. S. Hammond, Whiting Corp., Harvey, Ill.; H. S. Hersey, C. O. Bartlett & Snow Co, Cleveland; Thomas Kaveny, Jr., Herman Pneumatic Machine Co., Pittsburgh; O. A. Pfaff, American Foundry Equipment Co., Mishawaka, Ind.; and B. C. Trueblood, Arcade Mfg. Co., Freeport, Ill.

P. J. Potter and Thomas Kaveny, Jr. were re-elected president and vice president respectively.

Other subjects discussed at the meeting were primarily of a public relations character indicating a realization on the part of members of the advisability of promoting a better general understanding of the basic importance of foundry equipment to all other metal working industries.

Advisory Committee Is Formed

Formation of a plumbing and heating defense industry advisory committee was completed recently at the Office of Production Management and includes the following: George Hoffman, manager, plumbing division, Crane Co., Chicago; William M. Byrd, vice president, Alabama Pipe Co., Anniston, Ala.; E. S. White, president, United States Radiator Corp., Detroit; W. L. McGrath, vice president, Williamson Heater Co., Cincinnati; E. C. Sammons, vice president, Iron Fireman Co., Portland, Oreg.; J. A. Doucett, vice president, Revere Copper & Brass Co., New York; R. L. O'Brien, president, Detroit Brass & Malleable Co., Detroit; O. S. Swats, assistant sales manager, Grinnell Co., Providence, R. I.; M. W. Dennison, Braman Dow & Co., Boston; L. F. Hudepohl, president, T. S. Conner Co., Cincinnati; H. M. Reed, president, American Radiator & Standard Sanitary Corp., New York; Charles D. Wessels, president, Wessels & Sons, Detroit; M. F. May, vice president, Young Radiator Co., Racine, Wis.; Frank C. Packer, Payne Furnace & Supply Co., Beverly Hills, Calif.; Harold Sweatt, president, Minneapolis-Honeywell Regulator Co., Minneapolis; N. H. Wiewel, Jones & Laughlin Steel Corp., Pittsburgh; R. L. Stewart, vice president, Stockham Pipe Fittings Co., Birmingham, Ala.; G. E. Mumma, assistant supervisor, plumbing division, Sears, Roebuck Co., Chicago; Edward Costello, Costello Engineering Co., Washington.

2nd. Installation
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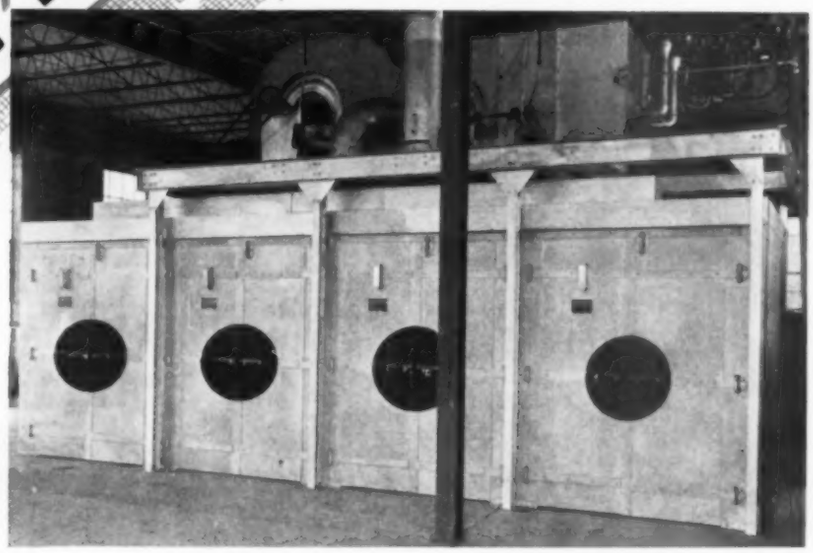

Carl-Mayer Core Oven installation just completed for Frank Foundries.

25 to 50% Savings!

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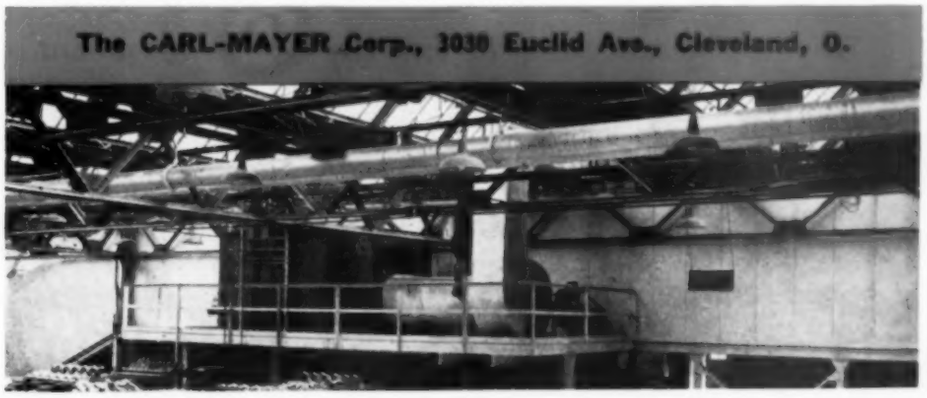

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Purdue HOLDS REGIONAL FOUNDRY CONFERENCE

GROWING shortages of certain raw materials are forcing the foundry industry to attempt various substitutions, and frequently these are working out with better than anticipated success. This fact was brought out at the Joint Regional Foundry Conference at Purdue University, West Lafayette, Ind., Oct. 17-18, sponsored by the Central Indiana, Michiana and Chicago chapters of the American Foundrymen's Association and the engineering extension department of the university.

More than 200 foundrymen from Indiana, Illinois, Michigan, Wisconsin, Ohio, New York, and a few other states, attended the conference. The two-day program embraced morning and afternoon simultaneous sessions devoted to gray iron, malleable, steel and nonferrous castings problems. First day attention was centered on materials shortages and substitutions, and second day to discussions of foundry practices. A dinner on the evening of the first day, attended by over 150, also dealt with material and other shortages as created by the national defense program.

Comments on National Defense

J. D. Burlie, engineer, sheet metal, foundry and woodwork, Western Electric Co., Chicago, and chairman of the general conference committee, presided at the dinner held on the evening of the first day and introduced chairmen of the three sponsoring A. F. A. chapters, committee members, and university representatives. Musical entertainment during and immediately after the dinner was presented by a group of Purdue students, under the direction of A. P. Stewart, director of choirs and choruses of the university.

In welcoming visiting foundrymen to the University, Dr. A. A. Potter, dean of engineering, made some interesting comments on national defense and the relation of industry, including foundries, to it. He said in part:

"Our men of genius who are responsible for more than two-thirds of the epoch making inventions of our times will not fail us in this, our first and most decisive battle of the present World War, which I hope we can keep on fighting in the field of armament production.

"Most machines had their beginning in the sand pile and cupola, and foundry processes affect not only factory production but also most forms of transportation and modern living from the playground to the kitchen."

Shortages in materials are less serious than our deficiencies in spirit and in character, the convention was told by E. L. Shaner, president, Penton Publishing Co., principal speaker at the dinner.

"Today only about 15 per cent of our national resources is devoted to defense. We are told this percentage must be upped to more than 30 per cent by the end of 1942 and that we may have to exceed 50 per cent at the peak of our effort.

Needs Are Growing

"This means that on the average, every industrial concern must be turning out twice as much output in October, 1942, as it is in the present month. Companies now heavily engaged in defense work cannot hope to double their production, but others which until now have not shared in defense orders extensively can multiply their defense effort ten-fold or more.

"American industry can meet this challenge if it is accorded a reasonable chance to do so. But to be successful in the job allotted to it, industry must have better co-operation from government and from other divisions of American society than it has received thus far in the present emergency.

"To date the American public not only has been apathetic to the defense program itself but it also has been unmindful of the extent to which minority pressure blocs have interfered with the nation's effort to prepare for defense and for aid to the allies. This shortage in the American spirit is more important and infinitely more disconcerting than the shortages in materials which have been plaguing industry these recent months . . .

"The critical shortage in America does not involve material things. We can manage to develop the physical plant, equipment, supplies and materials required to win the war.

"But can we overcome the shortage in the character and in the spirit of ourselves?"

Several hundred Purdue engineering students were afforded an insight into the properties and uses of castings at a special meeting arranged through co-operation of the engineering schools and the conference committee, and addressed by W. W. Rose, executive vice president, Gray Iron Founders' Society, Washington. C. E. Westover, executive vice president, American Foundrymen's Associatioin, Chicago, presided at this meeting which was held Friday morning.

Mr. Rose mentioned various types of ferrous castings, but dealt chiefly with gray iron, pointing out that this material has extremely wide industrial uses as a result of its advantageous properties. Among these properties he listed the ability to obtain comparatively high tensile strength through alloying; good damping characteristics; excellent resistance against wear, galling and seizing, corrosion and high temperature; good machinability; and good casting qualities.

Search for New Markets

In concluding, he outlined the opportunity for product development and search for new markets. Scarcity of materials as a result of the war will afford the foundryman the opportunity to develop new needs and adapt his improved technique to regaining and holding lost ground. To accomplish this, we must look to and employ engineering profession. The industry has been too slow in doing this.

Steel and malleable scrap charged by the average malleable iron foundry has changed in recent months, it was pointed out by P. A. Paulson, metallurgist, Gunite Foundries Corp., Rockford, Ill. at a session held Friday morning with J. H. Lansing, Malleable Founders' Society, Cleveland as chairman. Instead of the steel rails and railroad malleable scrap formerly obtained, the malleable scrap now delivered is a mixture of agricultural and automobile material.

Although brake drums and differential assemblies can be removed, much steel remains. Non-recoverable

material, such as dirt and rust, is approximately double for a given weight of miscellaneous malleable scrap than for railroad material.

Scarcity of steel rails has necessitated substitution of other low carbon scrap, particularly bundled material. While previous use of this scrap had been unsatisfactory, it has recently been used in considerable amounts in the cupolas and the air furnaces with good results, the speaker said. The practice of burying it in the charge has helped greatly. One advantage of bundled scrap is that the phosphorus content of the melt may be reduced several points more than in the use of steel rails which often show that they have been made of bessemer steel.

A warning to foundrymen not to consider as permanent the business which has accrued to them through scarcity of certain metals, was voiced by Carl F. Joseph, chief metallurgist, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich. at the Friday afternoon session under chairman J. H. Lansing. Mr. Joseph's paper was devoted chiefly to a discussion of replacement of nonferrous and forged steel parts with ArmaSteel, a graphitic steel made from white cast iron of the following composition: C, 2.65; Si, 1.30; Mn, 0.40; S, 0.13; P, 0.05. The metal charge is melted in a cupola and refined and superheated in an electric furnace. His paper is presented on page 54 of this issue.

In most cases failure of a malleable casting is not due to improper analysis or physical properties but is usually caused by an unsound condition which could have been eliminated by proper design and gating, it was stated by C. C. Lawson, superintendent, Wagner Malleable Iron Co., Decatur, Ill. at a session held Saturday morning with G. B. Stantial, Illinois Malleable Iron Co., Chicago, in the chair.

Change The Design

He recommended thorough study of a casting blueprint before making the master pattern, in order to seek means of eliminating shrinkage and cracks without going to such measures as feeder bobs, cracking fins, tunnel cores, risers, extra sprue, chills, etc. "Adding of fillets and even distribution of metal, if the customer will permit it, should always be considered. In many instances we have taken metal from a heavy section and added to a lighter section without increasing or decreasing the weight. The resulting castings were much stronger, and misruns, cracks and shrinks were eliminated.

"Pattern layout is just as important as having a pattern properly designed. Before we make our layout we must first decide where we are going to gate." Slides of a number of castings were shown to illustrate how shrinkage was prevented by proper gating, in some instances by addition of fillets. In the case of a 30-pound valve wheel, 20 inches in diameter, the only effective way found to prevent the rim from flying apart in cooling is to cut a ¾-inch piece from it. After the casting is completed, a malleable plug is brazed into the open section.

In subsequent discussion it was brought out that raw materials have an important effect on shrinks and cracks. Weather conditions, influencing the humidity, also are a factor, as indicated by the general experience that better castings are obtained in the winter than in the summer.

Sand Affects Surface

Sand preparation should be the starting point in producing a good casting surface and one which will clean readily, according to J. H. Lansing, shop practice engineer, Malleable Founders' Society, Cleveland at a session on Saturday under chairman E. C. Bumke, Oliver Farm Equipment Co., South Bend, Ind.

"Molding sand should be of adequate refractoriness for the sections of metal which are to be cast," he stated. "A sufficient amount of sea coal should be used to enable the castings to peel readily and to prevent the possibility of sand becoming too tightly fused to the metal surface. Again, the sand must have sufficient strength to prevent its washing and becoming cemented into the semi-liquid surface of the metal. In such a case no cleaning operation can possibly remove it.

"After molds have been poured, castings should not be immediately shaken out as, especially in the case of heavy castings, more sand will cling to the casting. This entails a loss of sand, a weakening of the sand and may increase cleaning difficulties."

Various cleaning methods, including tumbling, sand blasting, airless blasting and water tumbling and blasting, and the advantages of each were described. Mr. Lansing stated that a comparative test at one plant showed that machining cost was highest and tool life lowest when castings were tumbled. Next in order came sand blasting, airless cleaning and finally pickling.

Data collected from various plants on abrasive consumption indicated that requirements increased in airless blasting in proportion to the

(*Continued on page* 90)

Group of castings and cores used by M. J. Gregory in his talk, and later presented to Purdue University

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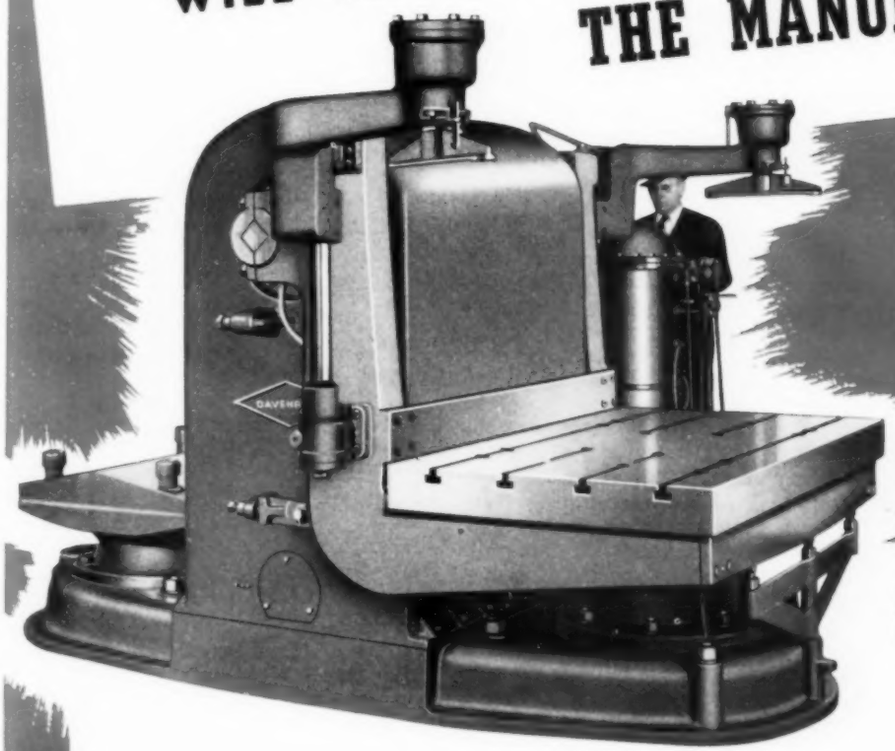

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(*Continued from page* 88)
number of loads cleaned per hour. This infers that shot or grit is lost in removing castings from the machine. Abrasive consumption also is found to vary with the shape of casting, an average being about 4 to 5 pounds per ton of castings cleaned. In later discussion it was agreed that cleaning costs at malleable plants should range upward from at least $1.50 a ton. Several foundries reported they cast their own blades for replacement in airless blasting equipment. One uses a white iron containing 10 per cent molybdenum and 4 per cent chromium. While relatively expensive, such blades have a life of 80 to 100 hours and save time otherwise required for replacement.

Dealing with the present situation in alloys, D. B. Reeder, metallurgist, Electro Metallurgical Co., Chicago, at a Friday morning session with V. A. Crosby, Climax Molybdenum Co., Detroit, chairman, pointed out that the ordnance program has resulted in a considerable change in the requirements of the steel industry for ferroalloys, while in the past the automotive industry has been the predominating factor. One important reason for the change is that ordnance requires killed steels in which silicon is used, whereas automotive has used a large proportion of rimming steels. This change also has increased demand for manganese, chromium and other alloys. Alloy manufacturers foresaw the shortage in 1938 and accumulated large inventories of ores, so that they are able to keep pace with demand.

Must Meet Ballistic Tests

The speaker stated that armor plate for tanks is partly cast steel and contains alloys. The composition is left to the individual producer, but ballistic tests must be met. Most alloys are on priority or allocation due partly to the fact that electric power is required for production of many of them and there is a shortage of power. OPM frowns on anyone carrying over a 30-day supply of alloys.

Alloys on priority at present are calcium, silicon, ferrochromium, ferrotitanium, vanadium and tungsten. In the opinion of Mr. Reeder, however, the alloy situation is in reasonably good condition and consumers will be supplied but not allowed to carry unwarranted inventories.

At the Friday afternoon steel session under the direction of H. A. Forsberg, Continental Roll & Steel Foundry, East Chicago, Ill., it was stated that fundamentally, metal founding consists of arranging for solidification of molten metal to produce a shape without which further forming work other than machining is performed. According to F. A. Melmoth, vice president, Detroit Steel Casting Co., Detroit, this effort may be doomed to failure unless there is appreciation of the primary significance of solidification procedure.

Progressive solidification is a joint effect of design and method of pouring and feeding, and to achieve it a casting should solidify evenly and progressively from its lower part to one or more points at its upper surface, to which can be attached risers or reservoirs of hot metal which can make available the necessary liquid steel to compensate at the right time for volume lost by liquid shrinkage.

To meet the requirements of correct solidification, Mr. Melmoth emphasized that temperature gradients of both mold and contained steel, when pouring is complete, should be parallel, the lowest temperature of both being at the bottom end.

Mold Is Rotated

To produce this condition, the mold is actually poured in a position conducive to the least trouble from erosion, and so gated as to produce the maximum temperature effect in both mold and metal at the riser, and while still liquid is rotated through the necessary angle to bring the risers to the highest point during solidification. By so doing, said Mr. Melmoth, the temperature gradients of mold and metal are maintained in the same direction, so that all possible assistance to progressive solidification takes place.

Increasingly rigid demands for good electric steel castings require that more attention be given to standardizing electric furnace melting practices, asserted B. J. Aamodt, superintendent of steel foundry, National Malleable & Steel Castings Co., Cicero, Ill., at Saturday's steel session under chairman S. E. McGinty, Burnside Steel Foundry Co., Chicago. He confined his attention to acid practice, which, he said, is generally used or preferred over basic principally because of its lower cost. Life of lining and roof is longer, and material, labor and power costs are lower. Tonnage output is higher, slag more viscous and metal more fluid.

Before all heats are tapped, the usual test bars should be poured, and, in addition, a porosity test of the metal should be made in a green sand mold, mainly for control purposes. Presence of a definite shrink in this test, and from its fracture, permits the melter to have a more definite idea as to its quality.

In outlining steelmaking practice in detail, Mr. Aamodt discussed solubility, reactions and equilibrium, diffusion and flotation.

Ordinarily a charge consists of foundry returns, plates, punchings and turnings. Up to 40 per cent of foundry returns may be used. To use higher percentages the mechanical properties of the final product may be inferior if the heat is not worked properly or not oxidized thoroughly. If a double slag method is used, larger percentages of remelt can be used with proper care for making the heat than can be obtained under single slag practice.

Features of design and construction which should be sought in direct-arc electric furnaces were enumerated and described by W. Harvey Payne, president, Hydro-Arc Furnace Corp., Chicago, at the same session. The electric furnace is a tool for making steel as well as melting it and should be designed to do its particular job in the plant. Aside from melting, it is important that the unit complete the reactions and alloy additions so as to change the melted metal into the proper specifications of steel, gray iron or malleable.

Considerable interest has developed of late in the side-blow converter for production of steel for small and medium-sized castings. Reasons for this trend and advantages of the process were discussed in a paper prepared jointly by A. W. Gregg, foundry engineer, Whiting Corp., Harvey, Ill., and F. B. Skeates, foundry superintendent, Link-Belt Co., Chicago. The paper was presented at a session held Saturday with H. K. Briggs, Miller & Co., Chicago, presiding.

Converter Process Returning

The authors stated that 25 years ago there were approximately 100 converters in operation in steel foundries in this country. The most recent tabulation shows 16 in operation in the United States and 3 in Canada. It is remarkable, they asserted, that a steelmaking unit which played such a vital part in development of the small and medium-size casting industry should have been discarded some 25 years ago and today is attracting an unusual amount of renewed interest.

Principal factors contributing to this interest were summarized by Messrs. Gregg and Skeates as follows:

1. Improvements in desulphurizing methods, with consequent improvement in quality and reduction of cost. 2. Development of electric eye equipment for control of the converter operation, making it easier to train operators and substituting control by a scientific instrument for that of the human eye. 3. High cost of electric power in many localities, and especially the very serious influence of the demand charge when production is small or intermittent.

(*Continued on page* 92)

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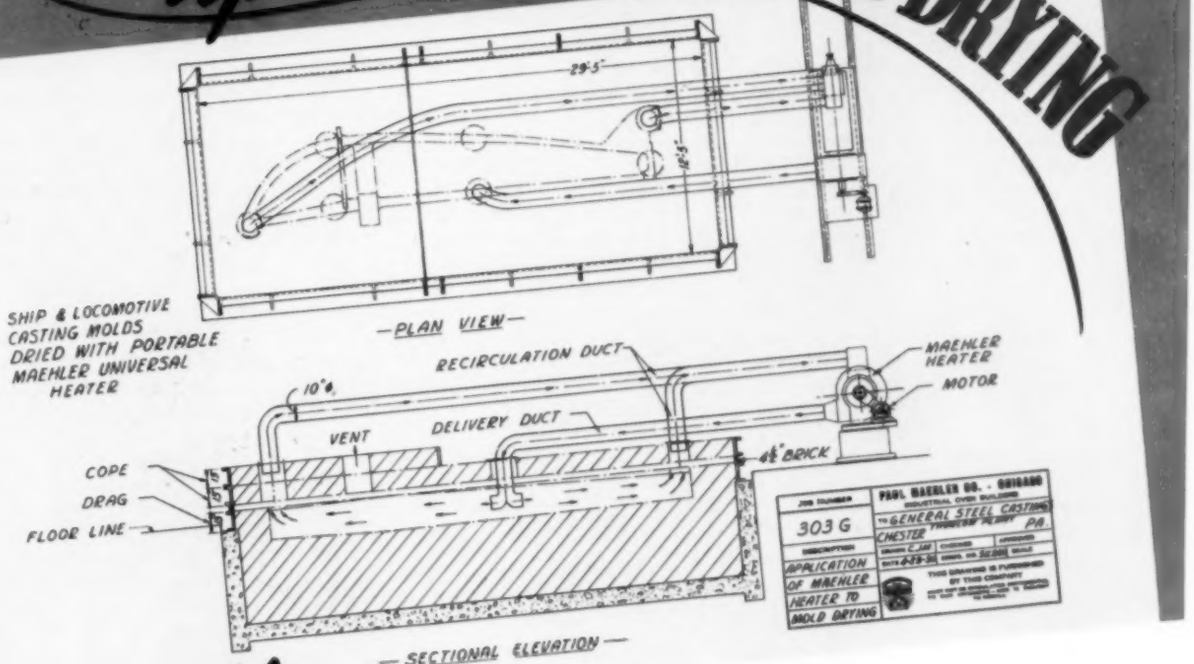

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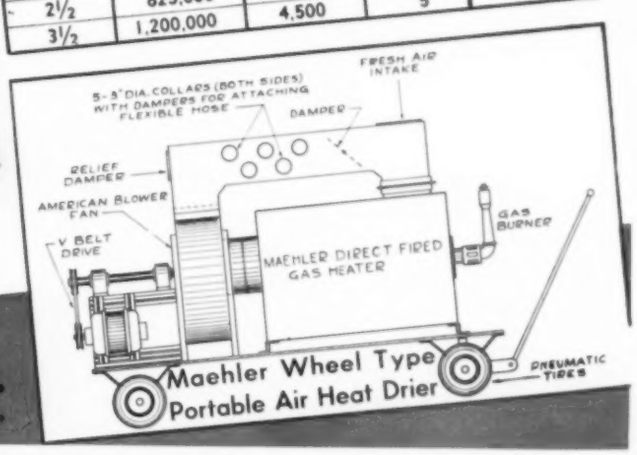
Maehler Portable Driers are made for gas or oil, complete with approved safety devices and automatic temperature control. Transportation is by crane or platform truck or driers can be supplied with wheels. Full details on request. Write today.

BUILT IN FOUR SIZES:				
Size No.	BTU	CFM	Hp.	Wt.—Lbs
1¼	240,000	1,000	2	1,100
2	400,000	1,750	2	1,400
2½	625,000	2,800	3	2,100
3½	1,200,000	4,500	5	3,200

Maehler Portable Mold Drier For Transportation by Truck or Crane.



The PAUL MAEHLER CO.
2200 W. Lake St., Chicago, Ill.

(*Continued from page* 90)

4. Flexibility of the converter operation. 5. Necessity for a continuous supply of molten metal if continuous molding, pouring and cleaning methods are to be employed. Triplexing with cupola-converter-electric-furnace makes continuous operation possible for the steel foundry. 6. Improved refractories.

Substitutions in raw materials because of shortages, was the subject for a large part of the discussion at technical sessions. Current practice of many foundries in this respect probably was typified by the statement by M. J. Gregory, factory manager, foundry division, Caterpillar Tractor Co., Peoria, Ill., at a gray iron session held Friday morning with A. S. Klopf, Hansell-Elcock Co., Chicago, presiding. He said that sometimes in case of emergency we do things which we would never attempt in normal times.

As an illustration Mr. Gregory mentioned the use of badly oxidized carbon steel carburizing boxes in place of good steel scrap. When these boxes were mixed in with other steel scrap, no bad effects were noted, either in the melting process or in the castings.

Another scrap substitution employed by the Caterpillar foundry is the increased use of briquetted cast iron borings in place of the more expensive but currently scarce motor block scrap. The amount being used depends on the supply, averaging between 15 and 25 per cent of the total charge. Additional machines are to be installed for making briquets from turnings and carbon steel borings. These briquets will be used instead of the compressed sheet scrap now being charged.

For several years the Caterpillar company has used copper as a substitute for nickel in all but a few applications. It is always used in conjunction with one of the common carbide forming elements, such as molybdenum or chromium. Copper may be substituted for nickel in amounts up to 1 per cent with no apparent change in the physical values obtained, except possibly the impact values, according to the speaker. Such applications of copper in iron include cylinder heads, axle housings and final drive housings. Cylinder liners, or sleeves, use a combination of chromium, molybdenum and nickel, because the nickel is obtainable from the plants machine shops in the form of turnings. Such scrap is segregated, baled and shipped to the foundry. All of the steel used in the mixture for liners is of this type and furnishes a nickel content of about 1 to 1.2 per cent, the remainder being obtained from gates, sprues, etc., from the previous heat.

Another gray iron session also was devoted to the effect on melting practices due to substitutions of materials because of shortages. Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., led the discussion.

Stress Importance of Gates

Contributing a paper on gating and molding practice at the Saturday morning session with Martin Lefler, Western Foundry Co., Chicago, presiding Elmer J. Carmody, foundry engineer, Charles C. Kawin Co., Chicago, asserted that gating and risering are important regardless of the defense program. Under stress of armament production, however, it is probable that inspection of castings may be more severe, consequently it is well to make sure that improper molding practice does not contribute to defects.

Foundrymen differ widely on the subject of gates—their position, size and shape, he continued. All are agreed that gate passage should admit metal to the mold quietly, rapidly and in clean condition. Risers or feeders should be provided to compensate for the metal which shrinks during the cooling process.

Theoretically, said Mr. Carmody, clean metal from the ladle should enter the mold clean, and usually it does. However, the hazard of foreign material in the metal stream always is present. Hence, the precautionary measure of using a gate that will catch any of this material at some point between the sprue mouth and the gate entrance.

Because molding sand affects surface finish of castings, it is a major problem confronting all foundries, a fact which foundrymen are coming to realize, declared W. G. Reichert, general foundry metallurgist, American Brake Shoe & Foundry Co., Mahwah, N. J. at a session on Saturday under the direction of chairman R. L. McIlvaine, National Engineering Co., Chicago. He reported upon an investigation made on molding sands to study the effect of each of the following factors: Grain fineness, moisture content, mold hardness, sea coal additions, method of ramming, and pouring temperature and fluidity. All factors except one were held con-

(*Concluded on page* 95)

SIDE GLANCES **By Galbraith**

"It's from the foundry, Tom! They don't care if you are getting old—they say you're a skilled man and they want you to come back to work!"

THE *Same Type* OF BENTONITE SHOULD *Not* BE USED ON THESE *2* JOBS!

Use Dixie Bond

Use Black Hills Bentonite

Having five distinct products and many combinations to work with, "ECP" can assure you of an unbiased "prescription" every time.

Black Hills Bentonite (Western type) should be used for the steel bomb for high dry and hot strength. It should *not* be used for the malleable housing because that same high dry strength might crack the casting.

Dixie Bond (Southern type) should be used for the malleable job on account of moderate dry strength and high collapsibility. It should *not* be used for the steel casting because that same moderate dry strength might cause cuts and washes.

You see, Mr. Foundryman, we don't have to "plug" any one bonding clay to *"straddle" all conditions,* because we produce five of them. These, plus a great number of combinations, enable us to recommend the one best material for your needs. Every "ECP" product is mined and manufactured under a rigid laboratory control which has kept any carload from ever being rejected. We promise you *better molds, better castings, less scrap and most bond strength per dollar.*

We continue to ship all orders within 24 hours.

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DIXIE BOND • BLACK HILLS BENTONITE • REVIVO BOND • REVIVO SUPER BOND • BALANCED REVIVO

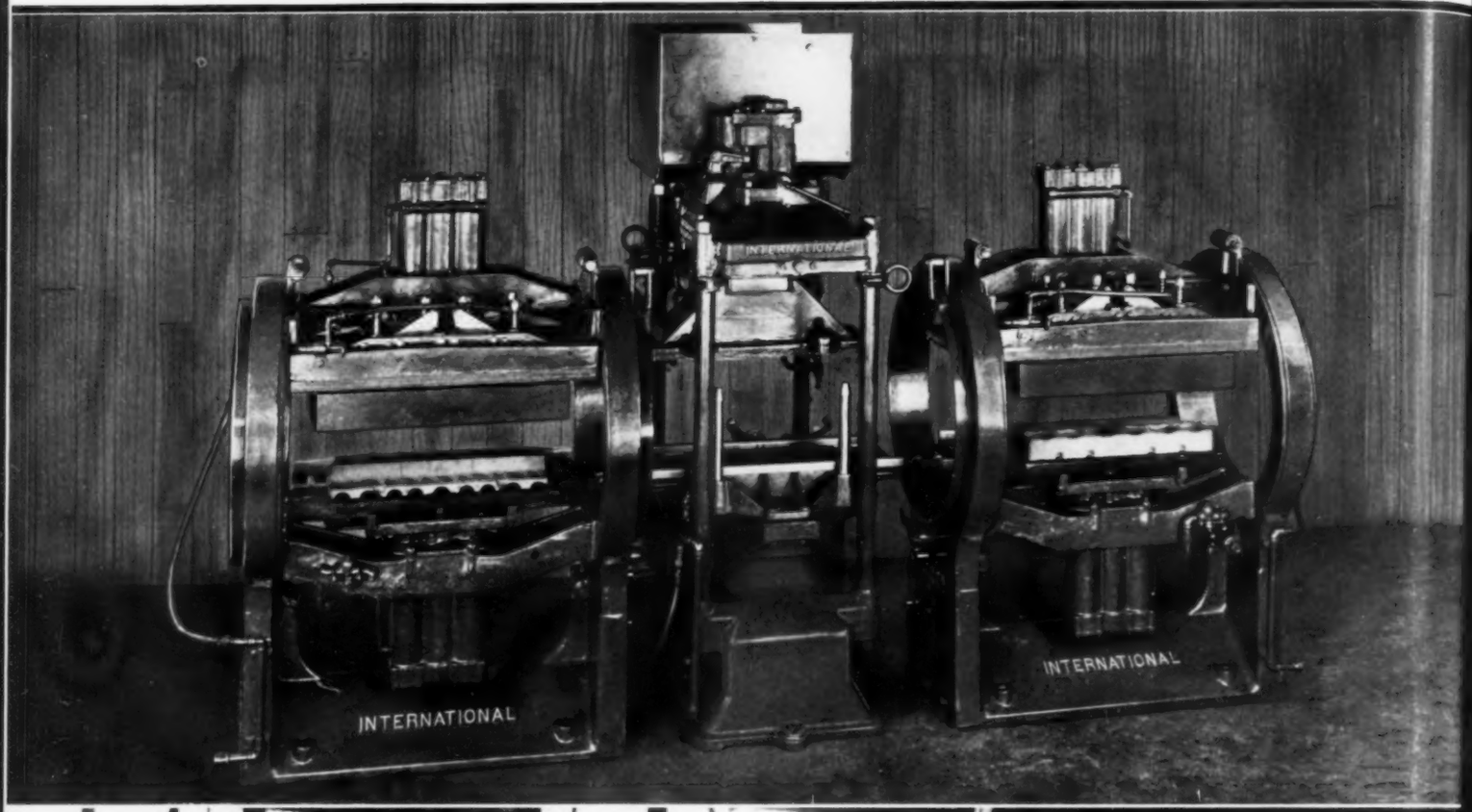
All TYPES OF BONDING CLAYS

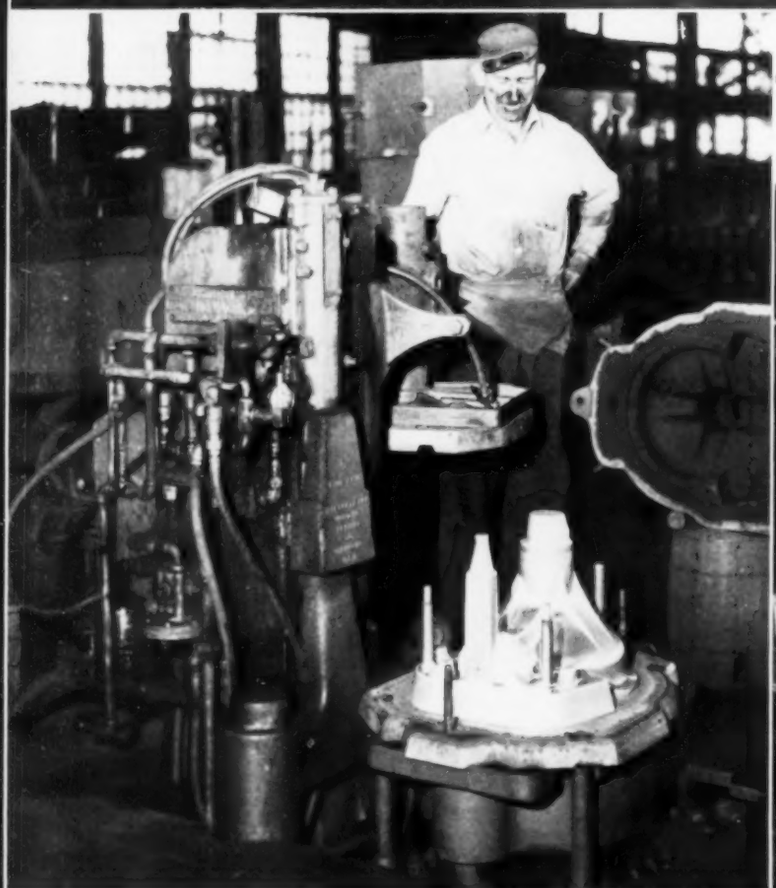
A Foundry Sand Service Based Upon Practical Research

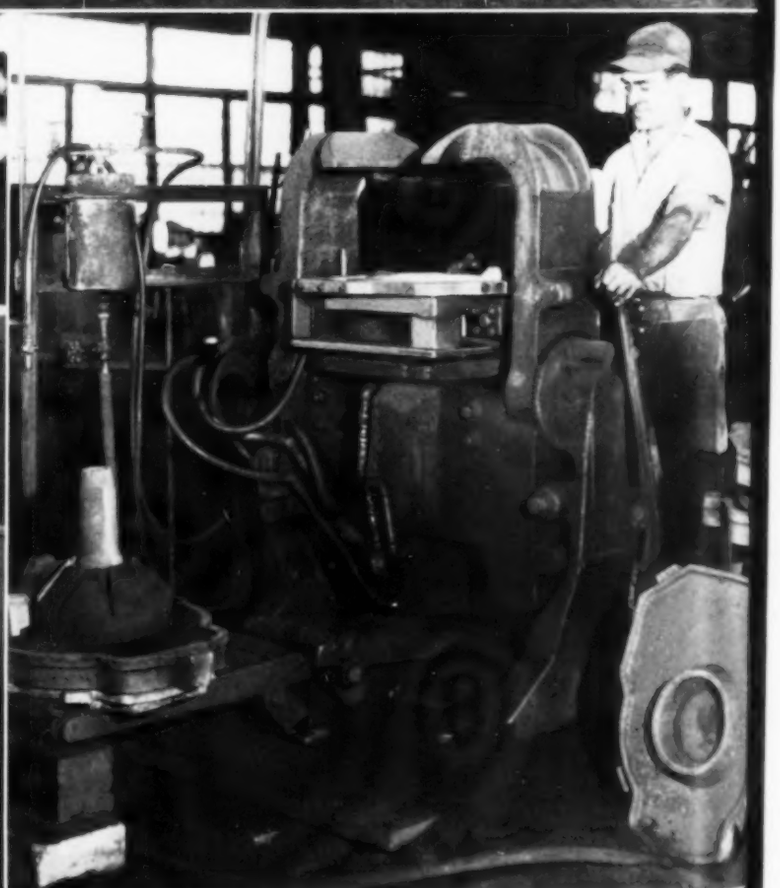
INTERNATIONAL MOLDING MACHINES

70 Standard Types

900 Regular Sizes







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(*Concluded from page 92*)
stant during each phase of the investigation to determine the influence of that one factor.

As to grain fineness, Mr. Reichert stated that as the size of the sand grains decrease, surface finish of the casting obviously is improved due to the smaller voids which do not allow metal penetration. The higher the temperature at which the metal is poured, the greater will be the tendency for the metal to fill the voids between the sand grains at the mold cavity.

It was observed that as mold hardness increased, surface quality was improved to a certain point. Increasing mold hardness produces a greater flow and forces the sand grains closer together, thereby filling the voids and producing a smooth finish. Sea coal when used moderately is beneficial in cleaning operations because it prevents the sand from burning the casting.

Loss Traced To Furnaces

Losses of physical properties intended to be found in nonferrous castings usually can be attributed to one or both of two causes, it was pointed out by W. B. George, metallurgist and foundry engineer, R. Lavin & Sons, Chicago. The session was held Friday morning with Clifford McKelvey, Chicago Hardware Foundry Co., North Chicago, Ill. in the chair. These causes are lack of feeding and gas absorption. The former is apparent in a fracture of the specimen in the form of a localized discoloration with a clear outline of crystalline structure. When the metal is gassed there is an even distribution of small holes, with larger holes outcropping in the heavier sections and an absence of outlined crystals.

Recommendations were given for determining the condition of atmosphere of different types of furnaces, as well as for best procedure in general operation of the melting units.

In discussing gates and risers, Mr. George stated that in order to produce a sound grain structure throughout the entire casting the metal must be solidified directionally from the farthest point of the mold, toward the gate or riser. To obtain small grain sizes requires that the metal be poured as cold as possible and still feed the casting. In the case of copper-tin and red brass alloys this temperature varies from 1800 to 2300 degrees Fahr., depending upon the size and shape of the casting.

Illustrations were given of proper and improper gating for different types of castings. In the case of thin-wall castings, it was emphasized that gates must be designed so that they are part of the casting itself and neither larger nor smaller than the wall to which they attach. Fillet radius between gate and casting should be one-half the wall thickness.

Speaking at a nonferrous session on Friday afternoon with Robert Langsenkamp, Langsenkamp-Wheeler Brass Works Inc., Indianapolis, presiding Harry W. Dietert, president, Harry W. Dietert Co., Detroit, discussed coremaking practice and core sands. He included classes of cores according to temperature required to harden, binders, mixing, baking, warm and green strength, collapsibility, gas content, permeability, moisture, standing time, hardness, and hot strength at elevated temperatures.

General practice used in the production of aluminum aircraft castings, approached largely from the metallurgical control standpoint, was described by F. E. Carl, assistant foundry superintendent, Delco-Remy division, General Motors Corp., Anderson, Ind., during a Saturday morning session under chairman G. E. Stoll, Bendix Products division, Bendix Aviation Corp., South Bend, Ind.

Factors which Mr. Carl discussed at considerable length were: Improved finish, minimum of internal imperfections, exacting control of physical properties, and close dimensional tolerances. At present, the only alloy used for aircraft work in this foundry is Alcoa No. 355, containing 4.50-5.50 silicon, 1.00-1.50 copper, 0.40-0.60 magnesium, and 0.50 maximum per cent iron. Molds, depending upon their size, are made on one of three types of machines, namely, squeezer, jolt roll-over, and squeeze roll-over.

Tensile Strength Higher

In addition to the sand foundry, there is a small permanent molding department. While the tonnage output is small compared to the sand foundry, this department is considered a valuable adjunct, Mr. Carl asserted. From a metallurgical standpoint, a permanent mold casting is stronger in tensile strength, has greater elongation and has probably a higher fatigue strength. It has less inherent porosity and a finer macrograin.

In a paper on magnesium sand castings presented during the same session, M. E. Brooks, metallurgist, Dow Chemical Co., Midland, Mich., brought up to date developments in practice since 1935. This contribution covered molding sands, including use of both natural and synthetic sands; sand agents, substances used as inhibitors in molding and core sands; cores, including binders, inhibitors, typical core mixtures, pasting practice, use of chills and storage; molding practice, which included use of filters for oxide films, pouring basins and gating and risering.

Mr. Brooks also described melting practice, including the open flux pot and crucible methods; casting finishing, including removal of gates and risers, heat treatment, heat treating furnaces, cleaning methods, and pickling treatments; and alloys classified according to compositions, characteristics and mechanical properties.

Apprentice Contest Will Be Held

According to A.F.A. Apprentice Committee the 1942 competitions for gray iron molding, steel molding, nonferrous molding and pattern making have been approved. The competitions are open to indentured apprentices in any shop, following the rules and regulations which are the same as have been in force for the past several years. Prizes of $30, $20 and $10, respectively, for the first, second and third place winners in each of the four competitions of the national contest have been approved by the A. F. A. Board of Awards.

The committee furnishes blueprints for the patternmaking competition and patterns for the three molding competitions. Local competitions may be held either by individual foundries and pattern shops or by groups or chapters. Individual local plants are privileged to send in one entry in each of the four classes, while those holding group contests are permitted to send in to the national display three entries in each class. Last year over 150 foundries and pattern shops had apprentices competing in the local contests.

The A. F. A. Apprentice Contest Committee is composed of the following: Chairman, S. M. Brah, International Correspondence Schools, Chicago; Frank C. Cech, Cleveland Trade School, Cleveland; H. L. Charlson, American Steel Foundries, East Chicago, Ind.; J. Morgan Johnson, Tri-City Manufacturers' Association, Moline, Ill.; C. W. Wade, Caterpillar Tractor Co., Peoria, Ill., and G. A. Zabel, Appleton, Wis.

Those desiring to have their apprentices compete in the contests should address the American Foundrymen's Association, 222 West Adams St., Chicago.

Carborundum Co., Niagara Falls, N. Y., has opened a permanent educational exhibit depicting the story of modern abrasives at the Museum of Science and Industry, Chicago. Charles Knupfler, vice president in charge of sales, presented the exhibit on behalf of the board of directors of the Carborundum company. Major Lennox Lohr accepted for the museum.

Activities of FOUNDRY GROUPS

Chesapeake

SATURDAY, Oct. 25, twenty-five of the Baltimore members of the Chesapeake Chapter journeyed by bus to Hotel Hamilton, Washington, for a special meeting to celebrate the first anniversary of the chapter. What a celebration! What an anniversary! J. E. Crown, of the Naval Gun factory, Earl J. Bush, C. L. Frear, H. F. Taylor and C. M. Saeger Jr., the committee in charge of arranging the outstanding affair, deserve a prize for their efforts. The program was one of the finest ever presented to the members of the chapter and everybody will remember it as one of the highlights of the season.

The session opened at 5 p. m. with A. L. Fairlay of the OPM Raw Materials Procurement department who discussed and answered questions about priorities as regards foundrymen. At 6:45 p. m. the Baltimore members arrived and were greeted by a reception committee of about 100 members and guests of the chapter including Robert E. Kennedy, secretary of the A. F. A. What a greeting after a 40-mile bus ride on the heavily traveled Washington boulevard. After the group had an opportunity to mill around, greet old friends, meet new people and partake of refreshments provided by the committee, the maitre de hotel announced the first and only call for dinner. Between courses of the Southern fried chicken dinner, which included everything from soup to salad, our old friend L. P. Robinson, director of core oil sales, Werner G. Smith Co., Cleveland, explained how through a strange circumstance he had the privilege of observing the personal habits and love life of pullets, roosters, etc., as well as experiencing the thrill of suddenly becoming a farmer through no fault of his own. Mr. Robinson's version of how he went into the chicken business via the mail order method and final discovery that every time a chicken laid an egg he lost money, was full of wit and humor. Yes sir, a night of nights for Chesapeake Chapter!

Chesapeake Chapter went to Washington to hold a meeting on Oct. 25 to celebrate the first anniversary of the chapter, and over 100 were present. Inset shows the committee whose efforts resulted in the successful meeting. Left to right: J. E. Crown, E. J. Bush, C. L. Frear, H. F. Taylor, C. M. Saeger Jr., and E. W. Horlebein. Photos courtesy Frederick Bruggman, Gibson & Kirk Co., Baltimore, Md.

The real part of the program started at about 8:30 p. m. when Mr. Robinson proved that he also knows a few things about core oils and how cores should be made, and proceeded to impart his knowledge of the subject to the 140 people present. During his talk Mr. Robinson pointed out that cores are somewhat similar to a loaf of bread; they have to be baked through at the proper temperature to be any good. Slow and thorough baking of cores is essential and it is impossible to rush them through to save time because invariably the cores will look perfect on the outside but the inside will not be baked and will cause castings to blow. Also, Mr. Robinson emphasized that it is necessary to have temperature control and proper circulation of heat in the core oven and advised that air circulators are being used successfully in many plants throughout the country. All appreciated Mr. Robinson's efforts and a hearty welcome to attend future meetings whenever possible was extended to him.

And now about the next meeting: Remember the smoker last December at the Hotel Lord Baltimore? Well, a wo.d to the wise is suffi-

(*Continued on page* 98)

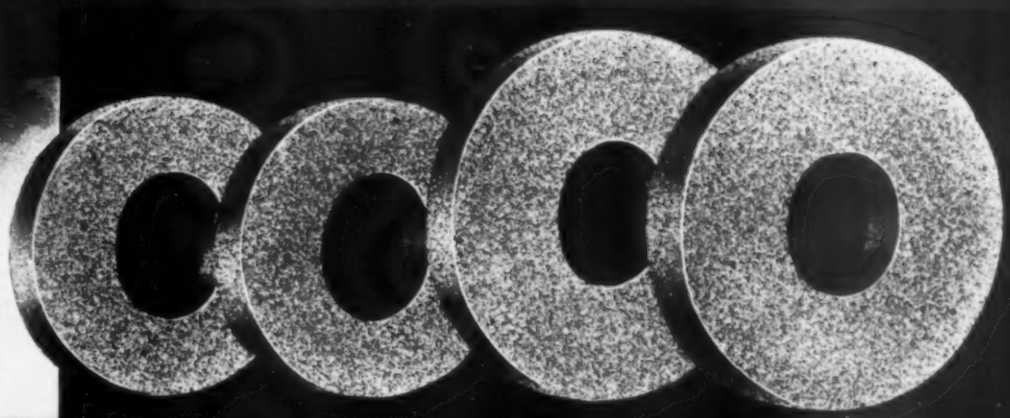
YOU CAN TURN OUT BETTER WORK FASTER here...

FOUNDRY production problems are quickly solved when correct grinding wheels are being used on your castings. Every job should have its particular wheel . . Sterling Grinding Wheels provide proper service to help you meet difficult delivery dates . . they are furnished in the correct bond, grain, shape, and size to help you turn out better work quickly.

In your stockroom, there may be many grinding wheels you can profitably use. Sterling engineers will gladly help you select the correct ones for your present jobs or recommend new Sterling Grinding Wheels to speed up your production.

Ask for the services of a Sterling engineer. He will gladly come upon request and make a free survey of your grinding needs. Write or wire today!

Send today for the code book outlining proper grinding wheel procedure. It will be sent at once if you request a copy on your letterhead . . . free, of course!



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THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
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THE WHEELS OF INDUSTRY

(*Continued from page* 96)

cient. The smoker will be held this year in the Grill room of the Southern Hotel on Dec. 6 at 8:30 p. m.—*Frederick Bruggman, reporter.*

New Jersey

APPROXIMATELY 110 turned out to hear talks on defense contracts and priority procedure at the meeting of the New Jersey Foundrymen's Association on October 28, at Newark, N. J. Col. J. D. Sears, manager, New Jersey office, Division of Contract Distribution, Office of Production Management, described the functions of his office and said that arrangements had been made to refer all inquiries for castings, from plants holding defense contracts or from government agencies, to the association office for distribution to local foundries, and that at the request of his office the association plans to make a survey of all New Jersey foundries to determine what foundries were most in need of additional defense work.

S. G. Oppenheim, New York office, OPM Priorities division, outlined foundry priority procedure for procuring all kinds of metals, equipment, repair parts, supplies, etc. Many questions were asked and there was a lively discussion. Mr. Oppenheim stated that affidavits from customers could be dispensed with if a properly worded statement referring to section 35A of the criminal code was signed by an authorized official of the company. He also described the defense supplies rating plan and explained the type of foundry business which would find it advantageous to use that plan. Mr. Oppenheim stated that priority control undoubtedly would become progressively stricter since at present defense work amounts to only 17 per cent of total production in the United States, but is increasing rapidly and is expected to reach 50 per cent eventually. In Germany it is reported to be 90 per cent, and in England 50 per cent.

The board of directors announced election of the following officers: President, John C. Phelan, Benjamin Eastwood Co., Paterson, N. J.; vice president, A. E. Winstead, Moore Bros. Co., Elizabeth, N. J.; treasurer, J. A. Williamson, Isbell-Porter Co., Newark, N. J.; secretary, John L. Carter, Newark. Karl V. Wheeler, vice president, American Steel Castings Co., Newark, was elected a member of the association.—*John L. Carter, secretary.*

Western N. Y.

REGULAR meeting of the Western New York Chapter was held October 3 with the largest attendance of any business meeting is the history of the chapter. Mark A. Daly presented an absolutely new and up to the moment picture of the dislocations which are taking place in the nondefense industries and summarized the situation in a manner most interesting to all present. Frank Redmond gave one of his *chalk* talks that painted a most instructive, entertaining and humorous picture of how we all individually muff many opportunities to promote safety.

As a tribute to the national vice president of the A. F. A., Duncan B. Forbes, Gunite Foundries Corp., Rockford, Ill., the chapter established another attendance record on Nov. 7. Mr. Forbes presented an informative outline of the association's activities for the year and pointed out exactly how all could assist in all of the different efforts. He received the assurance of the members and officers of complete cooperation. R. F. Lincoln, Osborn Mfg. Co., Cleveland, gave an interesting talk on the subject of "Molding Machines and Core Machines", which he illustrated with slides. Interest in the subject on the part of those listening carried the discussion period way beyond normal closing time.—*Eliot Armstrong, secretary.*

Chicago

A NEW location and a particularly attractive program on Nov. 10 initiated the 1941-42 series of meetings of the Chicago chapter. About 200 members and guests attended to inspect the new, more centrally located quarters at the Top of the Town Restaurant, and to hear F. J. Modrall, employment assistant, Eli Lilly & Co., Indianapolis, describe an outstanding "Merit Rating Plan" which his company has devised.

Chapter chairman L. L. Henkel, Interlake Iron Corp., presided at the dinner, and Vice Chairman and Program Chairman A. G. Gierach, American Manganese Steel Division, American Brake Shoe & Foundry Co., conducted the entertainment and meeting portions of the program.

During the dinner and for 30 minutes afterward, Miss Joan Claire, talented young organist, gave a concert of classical and popular music on a Hammond organ. This entertainment was presented through the courtesy of the Hydro-Blast Corp., and Hammond Instrument Co., both of Chicago. The organ program was an echo of the popular recitals which Miss Claire gave at the Palmer

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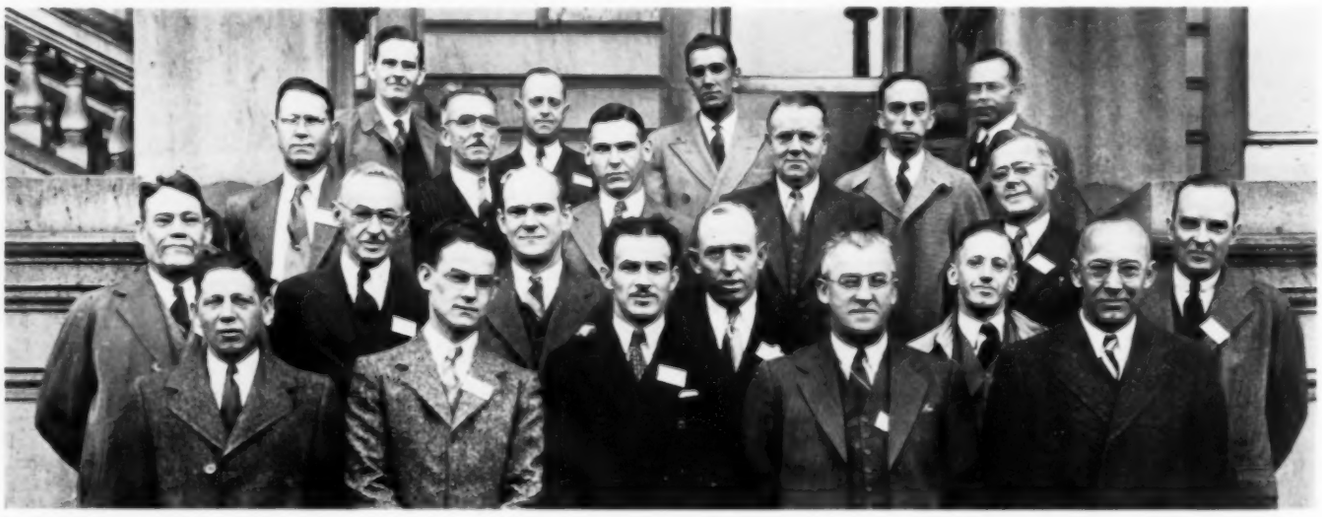
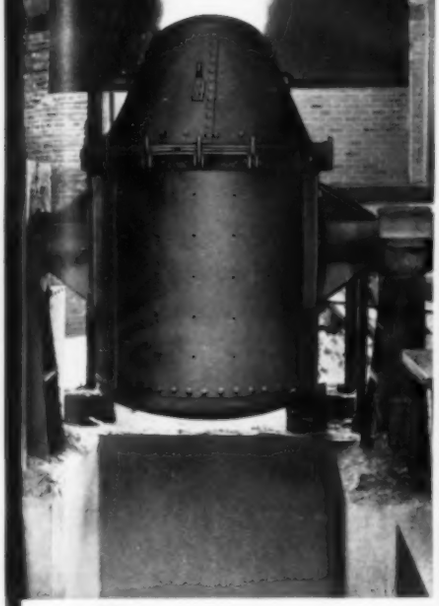
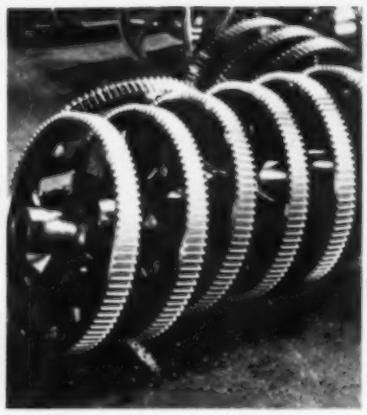
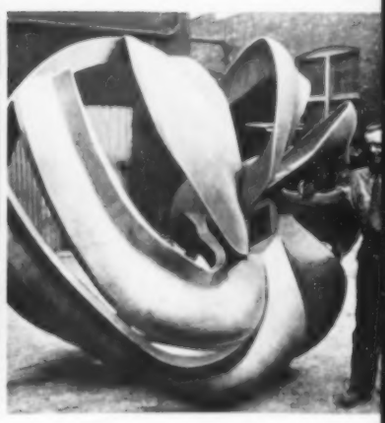


Part of the group from the Chesapeake Chapter that journeyed to Washington to celebrate the first anniversary of the chapter

NOW...High-grade Steel from CONVERTERS AT LOW COST!







FOR SMALL CASTINGS

Steel can be obtained from converters at exceptionally high temperatures—hot enough to run castings of the thinnest sections. Steel dog is ¾-in. tall, weighs 6 oz.

FOR Medium-Size CASTINGS

High quality steel is produced by the converter to the most exacting chemical and physical specifications. Typical example is found in the group of gears illustrated above.

FOR LARGE CASTINGS

The speed of converter operation makes it possible to combine several blows in one ladle. Cutter head casting, above, was cast from a 2-ton converter. Weight 5000 lb.

RESEARCH has brought the Converter back

Development of improved methods of operation and control has given rise to new interest in the flexible, low-cost, side-blow converter. Among the major factors responsible for its revived use are:

1. Improved methods of desulphurization, giving converter steel with sulphur below 0.03%.
2. Electric eye control for automatic indication of the end point of the blow.
3. Development of a triplexing melting method, using a cupola-converter-electric furnace combination, which permits continuous operation.
4. Better refractory linings, with longer life, less blowing loss, and lower maintenance.

In addition, the side-blow converter retains all of its well-known advantages. It may be installed for approximately ⅓ the cost of any other steel-making unit of equal capacity. Depreciation charges are not of serious proportions, and the demand charge for electric current is insignificant. Furthermore, a side-blow converter can be started and stopped on short notice. Three blows can easily be made in an hour. Its flexibility in producing high-temperature metal makes it adaptable to both small and large castings.

WHITING

SIDE-BLOW CONVERTER

Mail this Postcard for Booklet "NEW LIGHT ON AN OLD PROCESS"

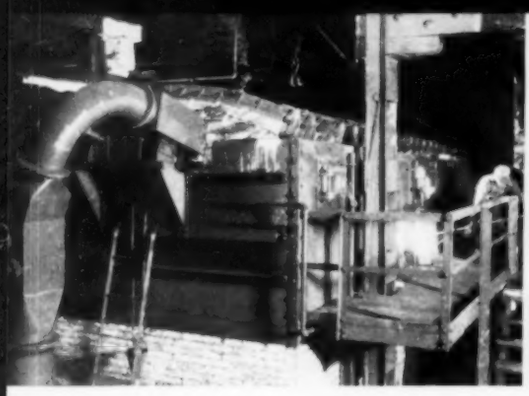
☐ Please send me your new booklet FY-104, explaining in detail the modern developments which have made the side-blow converter ideal for high-temperature metal.

Name.....

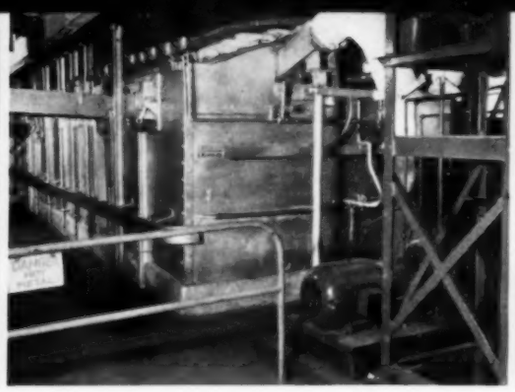
Title.....

Company.....

Address.....



The cupola to air furnace is a common form of duplexing. Here, an air furnace refines and superheats the molten metal received from the cupola in a large car wheel plant.



Frequently a combination of electric furnace and air furnace proves advantageous. A supply of metal may be held at the proper temperature and poured on a continuous basis.

The "cradle furnace," or tilting air furnace, is an important link in the operation of Brackelsburg furnaces. Quality metal is obtained and is available for continuous pouring.

Have you given full consideration to

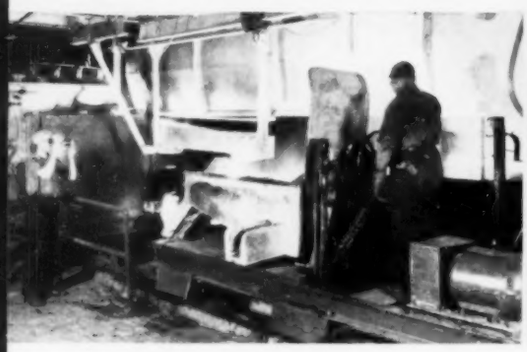
DUPLEXING?

IT WILL PAY YOU DIVIDENDS

Modern demands on foundry capacity require that each melting unit be operated to fullest possible advantage. In duplexing, where two units are combined, and in triplexing, where three units are combined, each unit is used for that particular phase of the melting, refining, or composition process for which it is best adapted. Melting and refining costs are lowered, accurate control of the chemical and physical properties of castings is obtained, and provision is made for continuous hot metal.

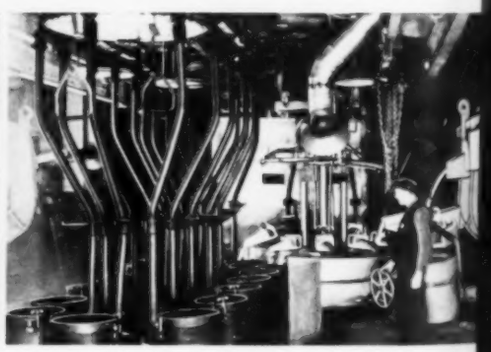
Faster melting, economies in labor, fuel, and charging material, and increased capacity are all factors which contribute to the production of high quality metal at low cost. With Whiting-engineered duplexing and triplexing systems, every detail of construction, method of firing, exposure area, temperature attained, impurity removal, and alloy addition is carefully considered. Each step is carried out in the unit and in the manner best adapted for that purpose.

All melting and heating units commonly employed in the foundry may be combined in one way or another to utilize the particular advantages of each. It will pay you to call in Whiting engineers to make a duplexing study in you plant.



In this installation at a large automotive foundry, a Whiting motor-operated ladle car shuttles back and forth to permit pouring engine molds on a continuous conveyor.

Another of the standard cupola-to-air-furnace duplexing installations. This process is used for malleable and gray iron with marked success. Uses less fuel, lowers sulphur content.



Here, a special turntable pouring device (center) was designed to fill molds carried by on a conveyor line (left). A Whiting "holding" furnace is at the right.

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WHITING

DUPLEXING METHODS

CUPOLAS · AIR FURNACES · CRADLE FURNACES
LADLES · MECHANICAL CHARGING SYSTEMS

(*Continued from page* 98)

House under the same auspices during the 1940 convention of the A. F. A.

In his address, Mr. Modrall explained that the merit rating plan used by Eli Lilly & Co. during the past year is working out gratifyingly well and is far superior to several others tried in the past. He made it clear that merit rating measures the workman and not the job. To illustrate, he said that job rating answers the question "How big is the job," while employe rating answers the question "How does the man measure up to the job." The plan described by Mr. Modrall is termed the "progress record" plan, because it permits a record to be kept of every workman's progress. Requirements for an adequate merit rating system, the speaker stated, are, first that it consider all important aspects of rating, and second, that it keep all factors as simple as possible. Four major factors only are involved in the rating of each workman, these being quality of work, quantity of work, dependability and compatibility. For each of these factors, five performance classifications are set up as follows: Far exceeds, exceeds, meets, partially meets, and does not meet requirements of the job. No attempt is made to grade employes mathematically Mr. Modrall emphasized, for if this were done, some deficiency might be offset by some proficiency, and thus give a false index. Check marks only are made on the record, although these are augmented by special comments.

Next meeting of the chapter will be held at the same location, Dec. 8, with the program to feature a series of roundtables. Subjects and chairmen are as follows: "Gray Iron and Malleable," G. B. Stantial, Illinois Malleable Iron Co., Chicago; "Scrap Situation," E. G. Howell, John T. McEnroe Co., Chicago; "Steel," F. E. Wartgow, American Steel Foundries, East Chicago, Ind.; "Ladle Linings," Harold B. McKee, Riverside, Ill.; "Nonferrous," Cliff McKelvey, Chicago Hardware Foundry Co., North Chicago, Ill.; and "Cores and Test Bars," C. V. Nass, assistant superintendent, Fairbanks, Morse & Co., Beloit, Wis.

The chapter is about to announce some new features for its 1942 foundry lecture course to start early in the year. Details are not yet available, but it is understood more lectures with less subjects are planned and the course will have wider appeal.—*Erle F. Ross*

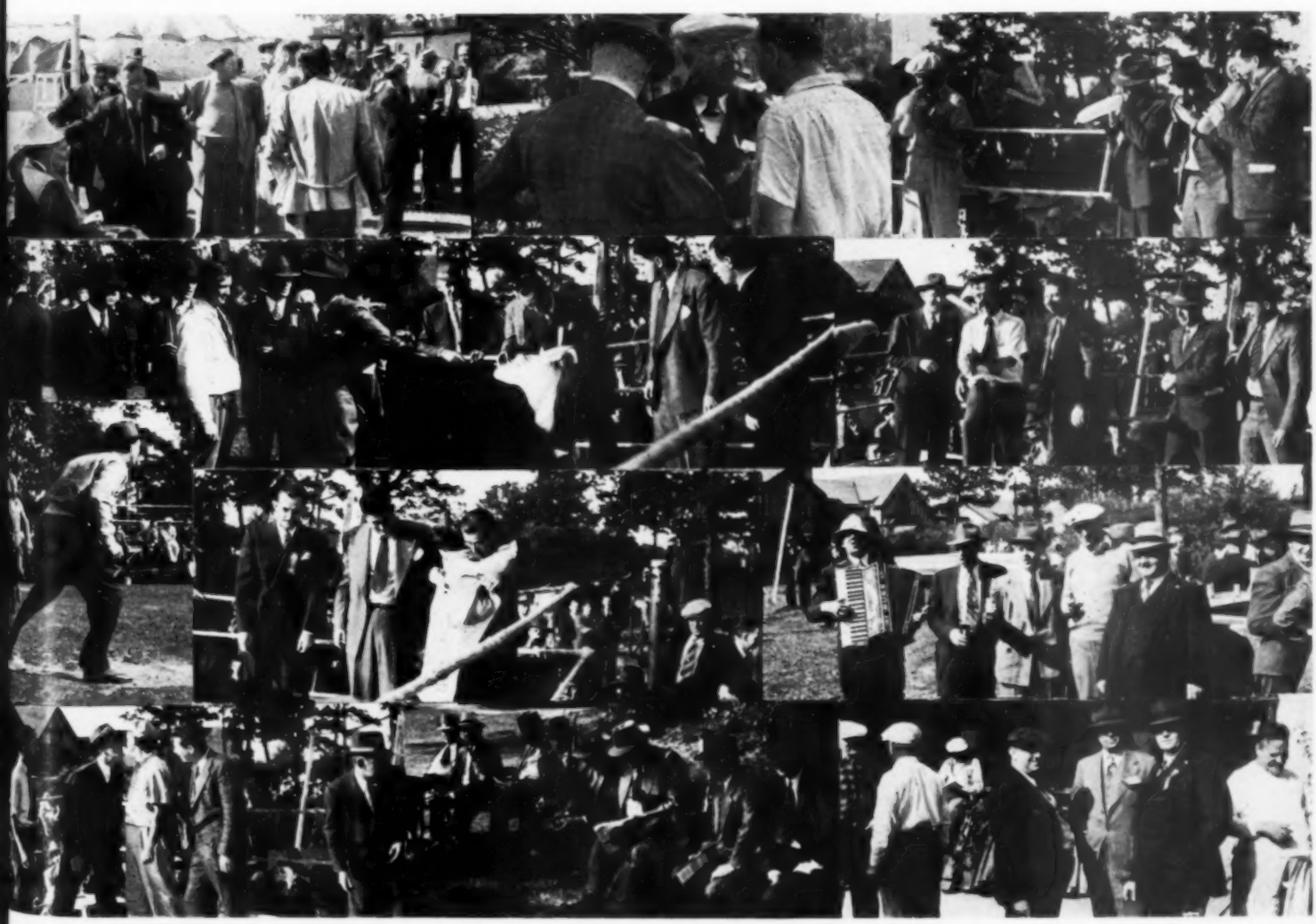
Michiana

CUPOLA practice and mechanical charging were the subjects discussed at the Nov. 11 meeting of the Michiana Chapter held at Hotel LaSalle, South Bend, Ind. Ninety were present and E. C. Bumke, Oliver Farm Equipment Co., and chairman of the chapter presided. A. W. Gregg, Whiting Corp., Harvey, Ill., was the speaker and he discussed each of the important factors to be watched in cupola operation, using a chart to set forth essential data for each standard size cupola. His talk also covered the usual types of mechanical charging equipment, which he illustrated with photographs taken in foundries of various sizes. A 30-minute discussion period followed the address.

Motion pictures of the September outing were shown. Chairman Bumke emphasized the importance of building chapter membership, and appointed a committee headed by V. C. Bruce to handle the work for the coming year.

E. C. Hoenicke, Eaton-Erb division, Eaton Mfg. Co., Detroit, will speak on "Permanent Molding Gray Iron" at the Dec. 9 meeting of the

Chicago Chapter's most successful outing held so far brought out a crowd of over 1000 members and guests. Photos courtesy of E. F. Wiechman Whiting Corp., Harvey, Ill.



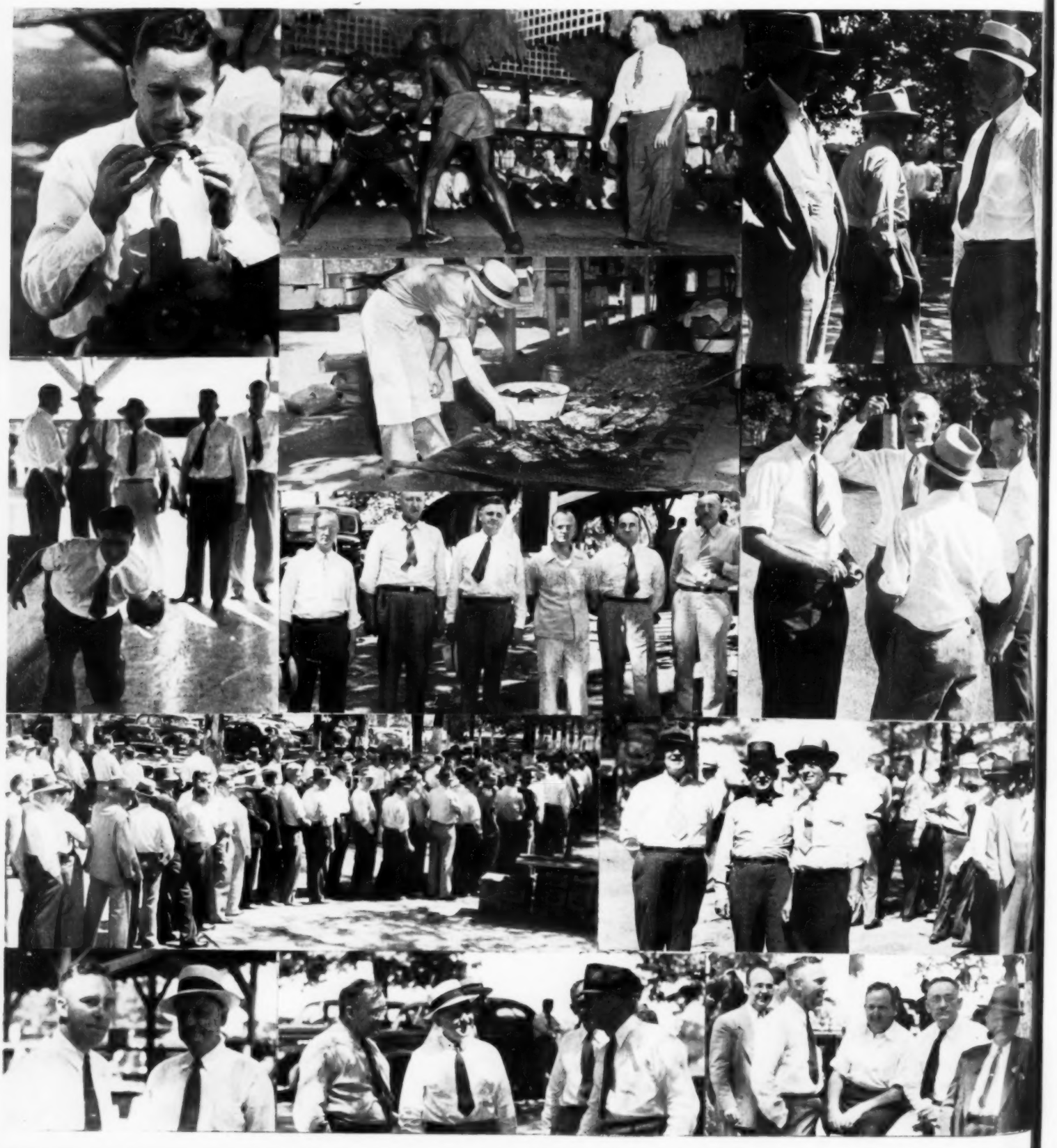
chapter to be held at Hotel LaSalle, South Bend.—*L. L. Andrus, secretary-treasurer.*

Birmingham

CHAIRMAN J. A. Bowers, American Cast Iron Pipe Co., welcomed members and guests of the chapter to the first meeting of the 1941-42 season of the Birmingham District Chapter held Oct. 17 at the Tutwiler Hotel, Birmingham. He then made a brief report on the chapter's annual barbecue and read a telegram of congratulations from the national office of the A. F. A. in Chicago. Howard Nelson gave a report on the apprentice training course of lectures being sponsored by the chapter in the absence of T. H. Benners Jr., chairman of the committee. Mr. Nelson urged those present to encourage the work by getting more young men of the industry to attend the meetings. A. S. Holberg, chairman of the membership committee reported eight

(*Continued on page* 104)

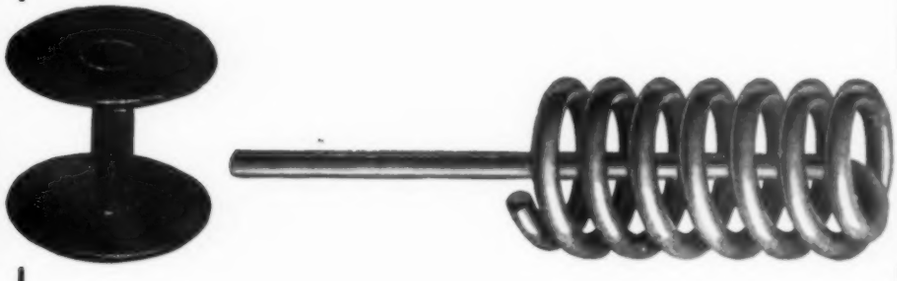
Sixth annual barbecue of the Birmingham Chapter constituting its first meeting of the year was held at Pine View Beach on Sept. 20 with approximately 500 present. Photos courtesy of Ralph Morrow, Birmingham; Gene Welchel and Billy McCullough, American Cast Iron Pipe Co., Birmingham



STEP UP DEFENSE PRODUCTION!

BEFORE another single day slips by . . . and production time is very precious right now . . . investigate what FANNER CHILLS and CHAPLETS can mean to your business, your vital share in the defense program.

Try our new SUPERCHILLS (patented). Compare them—test them—find out for yourself why so many other foundries are switching to them.



THE FANNER MANUFACTURING COMPANY

BROOKSIDE PARK, CLEVELAND, OHIO

Canadian Fanner Ltd., Hamilton, Ontario

(*Continued from page* 102)
new members.

The meeting was then turned over to W. H. Spencer who introduced the principal speaker of the evening, Capt. J. E. Getzen, Ordnance department, United States Army, who presented specific information on what producers should do in order to make castings that are needed and are being purchased by the various departments of the government for the national defense program.—*H. G. Mouat, secretary-treasurer.*

Metropolitan

FOUNDRYMEN must learn to take a more charitable point of view toward the man who made the castings we are today using as scrap," stated Max Kuniansky, general manager, Lynchburg Foundry Co., Lynchburg, Va. in addressing a group of some 60 members and guests at the second regular meeting, Metropolitan Chapter, Nov. 3, at the Essex House, Newark, N. J. Mr. Kuniansky spoke on the subject, "Scrap Metals for Making High Quality Castings in the Cupola." The meeting was under the technical chairmanship of Donald J. Reese, International Nickel Co., New York.

Mr. Kuniansky criticized foundrymen in general for being overconscious of the type of scrap used in making up their charges and suggested that if more attention were paid to technical control the field of usable scrap could be broadened considerably. The present day shortage of pig iron and accepted types of scrap is increasing the trend toward the use of melting materials which were formerly passed by as unsuitable. Mr. Kuniansky stated their present cast iron scrap included stove plate, cotton mill and automotive parts, car wheel and machinery scrap while their steel scrap consisted of automobile rims and the like.

The speaker told of the melting practice at the four foundries operated by the Lynchburg company, including shops making plow parts, centrifugally cast pipe, chemical industry castings and machine tools. He pointed out that the practice described was that used in their shops but that it was not necessarily recommended for other foundries.

In the pipe foundry where an analysis of 3.60 per cent total carbon and 2.00 per cent silicon is used the charge consists of 88 per cent scrap. Ninteen per cent pitch coke is used in the coke splits in order to obtain the level of carbon content and 7 pounds of soda ash is added per ton of metal which results in a reduction in sulphur content from 0.13 per cent 0.08 per cent. Mr. Kuniansky described their method of making pig iron by melting charges of 100 per cent scrap and casting into 6-inch diameter cylinders which are white and easily broken. The carbon content of this metal runs from 3.15 per cent at the beginning of the heat to approximately 2.50 per cent after the melting is well under way.

The speaker stated it is their practice to separate iron, steel and nonferrous metals in automotive scrap, saying that the value of the bearing metals recovered is enough to pay for the cost of separation. Manganese steel scrap is used as a source of manganese. Mr. Kuniansky said that with their extended use of scrap metals they regularly analyze their production for such elements as arsenic, tin and phosphorus which might prove troublesome when present in considerable amounts. The lengthy discussion which followed Mr. Kuniansky's witty presentation gave testimony to the high quality of his talk.

Next meeting was announced for Monday, Dec. 1, at which time representatives of various foundry equipment manufacturers will present short talks pertaining to their respective fields. The subjects to be covered include sand preparation, molding machines, foundry furnaces and casting cleaning machines.—*K. A. DeLonge, secretary.*

N. California

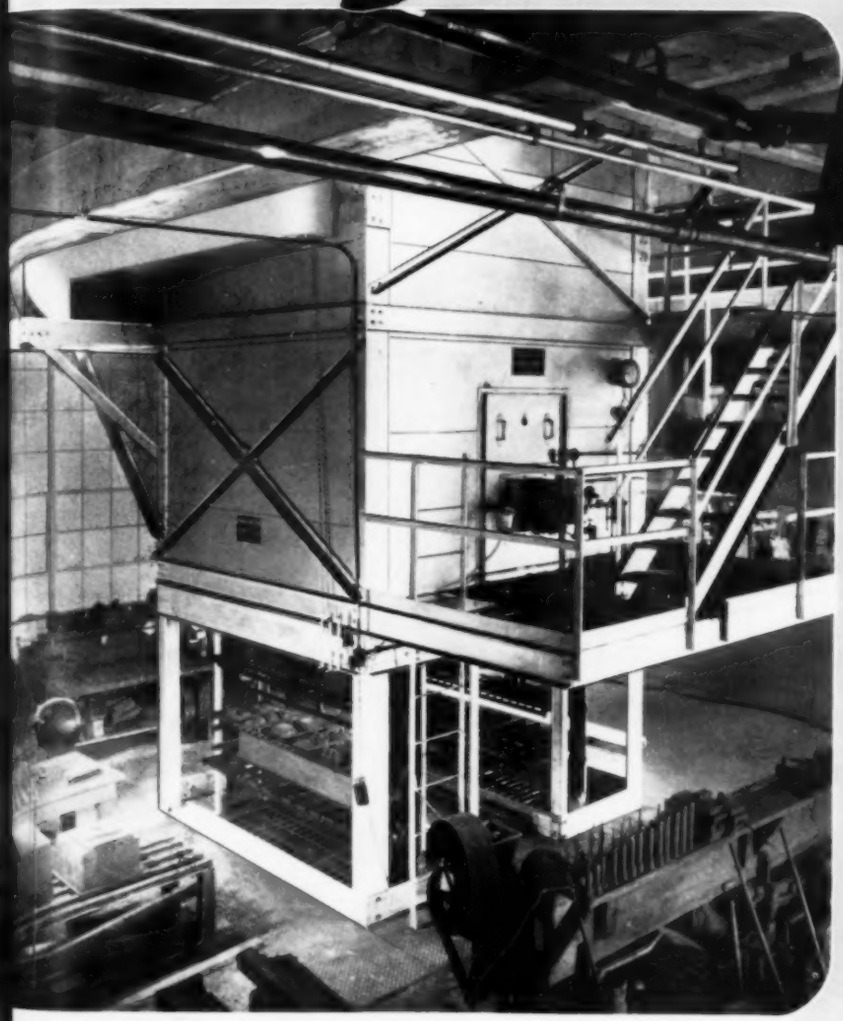
SECOND time in six years the chapter deviated from its regular date to a special date. This time the meeting was changed from Nov. 14 to Nov. 6, to take advantage of the presence of Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., who sometime past had advised of the date he would be in San Francisco. Seventy-five members and guests were present.

Centrifugally cast pipe is not a stranger to the city, although most of the members have not seen it

(*Continued on page* 107)

An excellent attendance was had at the A.F.A. committee luncheon held during the National Metal Congress at Philadelphia on Oct. 22. Photos courtesy of Bradley H. Booth, Jackson Iron & Steel Co., Jackson, O.

Coleman Tower Ovens SPEED DEFENSE PRODUCTION



Coleman Tower Core Oven at Kaukauna Machine Corp., Kaukauna, Wis.

SAVE
CORES, TIME, FLOOR SPACE, FUEL *and* LABOR

because

PATENTED CENTER AISLEWAY speeds up handling of cores by permitting three-way loading and close grouping of core makers around oven.

NO GASES ENTER THE WORKING AREA as cores are smoked off and cooled before unloading. Working conditions are therefore greatly improved, resulting in faster and better handling.

BAKING TIME IS CUT 50% due to exclusive Recirculating Heating System. Cores of various sizes are baked together without burning or underbaking.

SAVING UP TO 75% IN FLOOR SPACE by eliminating aisleways, racks and large area required by batch type ovens.

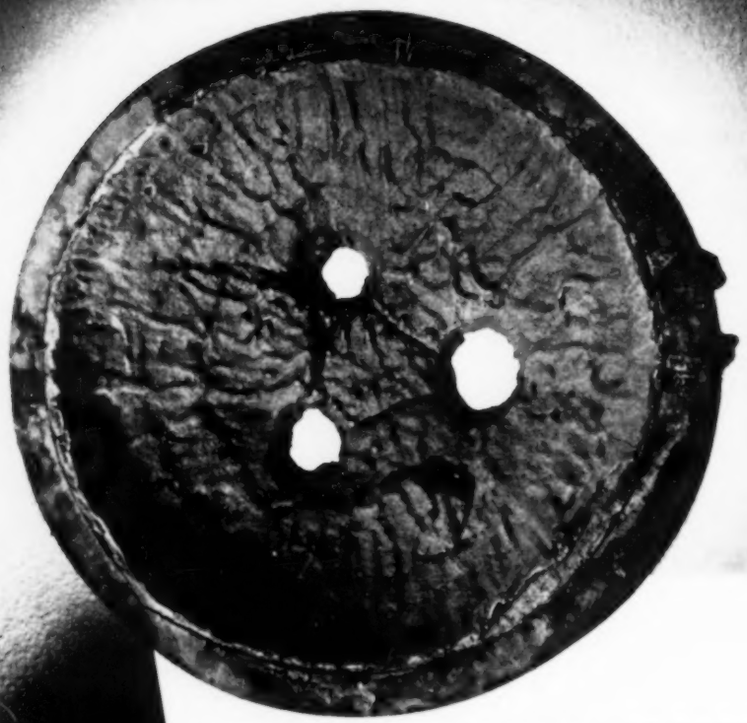
THE ABOVE ADVANTAGES MEAN that over-all core department costs are reduced 25 to 50% through savings in labor, fuel, core oil, etc.—that you get more and better cores at lower cost.

● We have specialized in Core and Mold Ovens for over 35 years. Coleman Ovens are built in all types and sizes to efficiently meet all core baking or mold drying requirements.

Over 5,000 successful installations prove the widespread acceptance of Coleman Ovens among leading foundries everywhere . . . *Write or wire for Coleman Oven Catalog.*

THE FOUNDRY EQUIPMENT CO.
BUILDERS OF COLEMAN AND SWARTWOUT OVENS
CONTRACTING ENGINEERS AND MANUFACTURERS
CLEVELAND, OHIO

CORE OVENS **COLEMAN** **MOLD OVENS**



FACTS

about

P.B. SILLIMANITE RAMMING MIX

and one man's furnace

FURNACE 500 lb. Moore 'Lectromelt.

SERVICE LIFE 2,275 heats, averaging 753 lbs. of metal per heat. One P. B. SILLIMANITE RAMMING MIX roof outlasted 4 silica side walls.

PRODUCTION 1,710,510 lbs. of metal or 855.25 tons.

PRODUCT Nickel anodes.

ROOF P. B. SILLIMANITE RAMMING MIX power tamped with aid of form, used for monolithic roof. 1200 lbs. required.

POWER CONSUMPTION

High	589 KWH per Ton.
Low	533 KWH per Ton.
Average	553 KWH per Ton.

COST OF ROOF Cost per heat **3.8c**

Cost per ton **10.3c**

These are typical operating facts about P.B. SILLIMANITE RAMMING MIX. You can not afford to overlook an operating statement of this kind, if you are using electric melting furnaces of this type, in the smaller sizes—1000 lbs. and under. P.B. SILLIMANITE RAMMING MIX will give you equal economy.

Write today for performance reports.

TAYLOR P B SILLIMANITE

CHAS. TAYLOR SONS Co.

MANUFACTURERS OF REFRACTORIES • CINCINNATI • OHIO • U. S. A.

(*Continued from page* 104)
made. Therefore, a great deal of interest was evidenced in Dr. MacKenzie's detailed explanation before W. L. Blair, local representative, showed a set of pictures of the plant and the equipment necessary to production. Needless to say, the audience was thrilled and accounted it one of the best and most spectacular programs presented. All were much surprised at one of the pictures showing the effect of subzero weather at a plant which was thought to be in the "Sunny South."

Dinner was delayed until 7 o'clock because Chairman E. M. Welch, American Manganese Steel Division, Oakland, Calif. was holding a meeting of the membership committee which is showing real interest in the Claffey slogan, "5000 in '42." Plans not only were made, but results followed immediately. The cartwheel committee badges are a real mark of distinction and went over well. At the next meeting it is expected to have the new coat cards and it is hoped there will be a strong tendency to change the guest badge for a membership badge.—*George L. Kennard, secretary-treasurer.*

Western Mich.

WESTERN Michigan Chapter held its regular monthly meeting Nov. 3, at the Occidental Hotel, Muskegon, Mich. Following a dinner attended by 90 members and friends, Gylleck the magician demonstrated what a sleight of hand artist really can do. The feature of the evening was the documentary kodachrome sound movie "Sand," presented through the courtesy of Whitehead Bros. Co., New York. In introducing the picture, V. L. Whitehead Jr., told of the hundredth anniversary of the Whitehead company and its desire to give the industry something interesting and informative.

December meeting of the chapter will be held Dec. 1, at Hotel Ferry, Grand Haven, Mich. The dining room, orchestra, and entertainment facilities of the hotel are to be for the exclusive use of the chapter that evening. The speaker will be representative of the Chrysler Corp., Amplex division, who will talk on "Powder Metallurgy".—*Max A. Amos, secretary-treasurer.*

Wisconsin

AN inspiring talk on, "Americanism", by Carl Taylor, executive secretary, Wisconsin Building and Loan League, featured the Oct. 17, meeting of the Wisconsin Chapter of the A.F.A., held at the Schroeder Hotel, Milwaukee.

Carl Taylor's theme hinged around the question, "What Made America a Great Country?" He stated that Americans own four out of five automobiles in the world and that the average American laborer can purchase a car with six months of his effort, whereas a laborer in England requires two and a half years to pay for an automobile of the same quality—the time being longer in all other nations of the world. The average American citizen has a standard of living so high that he has lost the ability to appreciate it.

Managers and leaders in America are those who have come up the hard way in a country which offers them the opportunity. Capital is the means by which both labor and management are provided with equipment to give us a truly abundant life. The future is ahead, and is full of opportunities not dreamed of by our forefathers. We must reverse the present trend of defeatism and develop progressive thought in our children so that they may look into the future and plan improvements upon the imperfect life of the present, both materially and spiritually.

An error was made in the report of the Sept. 26 meeting of the chapter, by crediting the sound film, "Goose Lake Fire Clay Deposit" to the A. P. Green Fire Brick Co. The film was presented through the courtesy of the Illinois Clay Products Co., Joliet, Ill., by A. S. Nichols, vice president.—*G. K. Dreher, secretary.*

Pittsburgh

PITTSBURGH Foundrymen's Association opened its technical year October 20 with a dinner meeting at Hotel Roosevelt, Pittsburgh. Principal speaker was C. E. Westover, executive vice-president, American Foundrymen's Association, Chicago, who outlined pattern mounting procedure, using a special plywood backing, which enabled economical production on a run as low as six pieces.

He also showed slides depicting the foundry industry exhibit, which covers 2600 square feet of floor space in the Museum of Science and Industry, Chicago, and described the work being done at that exhibit. The association, stated the speaker, is now endeavoring to further the use of castings in our defense program. One of the primary attempts in this direction is the preparation of a movie showing the work of the foundry industry. Prepared for general distribution, the film is calculated to increase public awareness of the capabilities of the industry.

The meeting was under the direction of C. J. Scheckhaus, new president of Pittsburgh Foundrymen's Association. Entertainment Committee Chairman J. H. McCrady announced the annual Christmas party will be held at Hotel William Penn on Monday evening, December 22.—*R. L. Hartford.*

Cincinnati

SIXTY members and guests were present at the Oct. 14 meeting of the Cincinnati District Chapter held at Shuller's restaurant. William M. Ball Jr., chairman of the chapter, presided. Principal speaker was J. Bland, assistant metallurgist, Brooklyn Navy yard, New York, who discussed, "Industrial Gamma Ray Radiography." Mr. Bland's previous experience with the production of radium and as consultant for the United States Navy yard in Brooklyn, provided background for his excellent presentation of the three sections of his program. First he showed a motion picture covering the production of radium from its discovery in Colorado in 1896 to the present where it is mined in the Great Bear Lake district of the Canadian Northwest, within 26 miles of the Arctic circle. Access to that mine is almost entirely by airplane, and during a short two-month summer season. The ore as dug from the ground is concentrated at the mine, and the concentrate is flown to the refinery at Port Hope, Ont. Mr. Bland then showed stereopticon slides which reproduced photographs of various defects in different kinds and shapes of castings as disclosed by radiography. Final section was a description of how the work is done which was followed by a discussion period.—*Henry M. Wood, secretary.*

Central Indiana

SAND Behavior in the Mold" was the title of the discussion by Earl E. Woodliff, Harry W. Dietert Co., Detroit, at the Nov. 3 meeting of the Central Indiana Chapter. The meeting was held at the Washington Hotel, Indianapolis, and approximately 125 members and guests were present. H. B. Harvey chairman of the chapter, presided, and I. R. Wagner, manager, Electric Steel Castings Inc., Indianapolis, introduced Mr. Woodliff. The speaker discussed fully the behavior of sand in the mold, illustrating his talk with sketches on the blackboard. In conclusion he demonstrated action

of sand under heat, with a dilatometer using various types of sand samples. Eugene Smith, E. W. Smith Co., Evansville, Ind., conducted a question and answer period following the talk.

Two motion pictures are to be featured at the Dec. 1 meeting of the chapter. One is, "The Operation of a Clay Plant," to be shown through the courtesy of Illinois Clay Products Co., Joliet, Ill.; the other, "Fire Brick," by the A. P. Green Fire Brick Co., Mexico, Mo. Meeting will be held at the Washington Hotel and follow the usual program of a dinner succeeded by presentation of the pictures and general discussion.

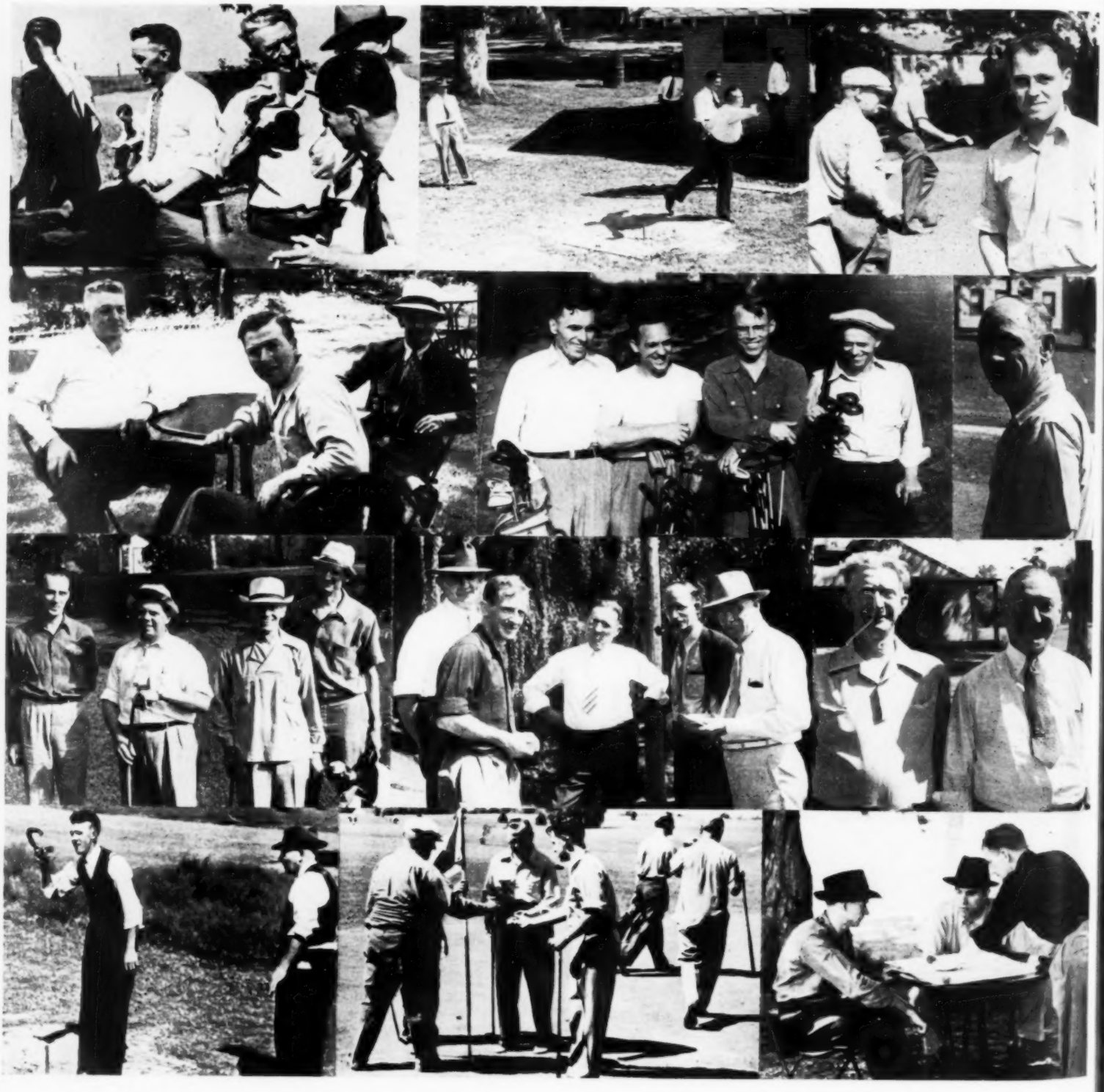
Date selected for the annual Christmas party is Dec. 13.—*R. A. Thompson, secretary.*

Connecticut

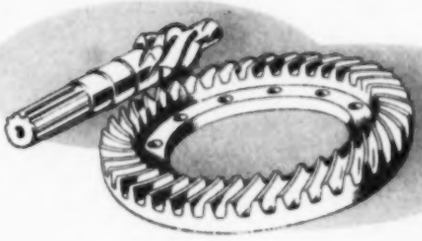
TWO hundred forty-fourth meeting of the Connecticut Foundrymen's Association was held at the Home Club, Meriden, Conn. Vice president Herman Schmidt presided in the absence of Robert C. Mills, president, and 51 members were

(*Continued on page* 110)

Central Indiana Chapter opened its Fall and Winter activities with an annual outing held at the Lake Shore Country Club on Sept. 13. Photos courtesy of S. C. Wasson, National Malleable & Steel Castings Co., Indianapolis, and G. A. Saas, Citizens Gas & Coke Utility, Indianapolis



Ford turns to MOLYBDENUM



Molybdenum Replaces Nickel

Nickel is important not only in the finish of plated metal but in improving the toughness of steel. In defense production it is used in the manufacture of aviation engine parts and armor plate. Ford valves, transmission gears, shafts, and other parts formerly containing nickel, are now alloyed with molybdenum and chromium. For the purpose, these parts are as good as or better than those replaced.

AMERICAN Production, American Distribution, American Control—Completely Integrated

Mines: Tucson, Arizona; Questa, New Mexico.

Smelting and Refining Works: York, Pa.; Washington, Pa.

Offices and Warehouses: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle, Montreal.

Sales facilities, technical advice, ample stocks available.

The advertisement of the Ford Motor Company here reproduced in part, is appearing in current magazines of general circulation. It gives an instance of the manner in which Molybdenum is entering into defense.

The Molybdenum Corporation of America, with adequate sources, supplies, and facilities under one management, invites your orders or your requests for information.

MOLYBDENUM CORPORATION OF AMERICA

GRANT BUILDING, PITTSBURGH, PA.

MCA

(*Continued from page* 108)

present. It was decided to hold the next meeting of the association on Friday, Dec. 5, at the Home Club.

Arthur M. Perrin, Brooklyn, N. Y., was introduced and he gave a talk on the feasibility of erecting a plant in Bridgeport, Conn., and equipping it for briquetting cast iron borings and steel turnings. The plant would have a capacity of 350 tons per week to start, and could be increased to 450 tons or more. Mr. Perrin stated it was planned to keep separate the borings and turnings of the various concerns so, if desired, the plants might purchase the briquets made from their own stock. Due to the restriction of priority ratings by the Office of Production Management, Mr. Perrin pointed out the difficulty of obtaining equipment for such a plant and requested assistance from companies interested. Robert Bullard, Bullard Co., Bridgeport, Conn., was present and stated that his organization was operating a briquetting machine and that the melting loss was about the same as with regular scrap.—*W. J. Maton, secretary, pro temp.*

N.E. Ohio

AT A well attended meeting of the Northeastern Ohio Chapter held on Nov. 13 at the Tudor Arms, Cleveland, announcement was made of the Christmas party Dec. 11 to be held in the Rainbow room of the Carter hotel. L. P. Robinson, chairman of the entertainment committee stated that 1000 tickets would be issued, the entire capacity of the premises and advised the members to make eary reservations. James G. Goldie, foundry instructor, Cleveland Trade School discussed features of the coming apprenticeship contest to be staged in connection with the convention and exhibition of the A. F. A. scheduled for April in the Cleveland Public Auditorium. Brief addresses were delivered by C. E. Hoyt, Chicago, exhibition manager and by Fred Walls, Detroit, member of the A. F. A. board of directors. Entertainment feature of the meeting was supplied by Howard M. Duff in a clever and witty running comment on a series of cartoons sketched rapidly.

Bradley H. Booth, metallurgist, Jackson Iron & Steel Co., Jackson, O., presented an interesting and scholarly address on silvery pig iron in the production of which his company has specialized for many years. The first part of the address was devoted to a historical review of iron making in India, China and Japan and later by many centuries in Germany and England. American iron manufacture began in Virginia where the first plant and the entire settlement were destroyed by the hostile Indians. Shortly afterward a blast furnace was established on the Saugus river, Mass., near Salem. Gradually as the population increased other iron working establishments were set up in New York, Pennsylvania and Ohio.

Old time records show that at one period 69 blast furnaces were operated in southern Ohio. They were small, crude plants, invariably built on a hill side to facilitate charging the furnace through an open top and with a capacity that ranged between 3 and 7 tons per week. Remains of many square stone stacks still are in existence in Ohio and Pennsylvania. The second part of the address illustrated by slides showed the author's plant in former days and contrasted early operating features with the present efficient and modern methods and equipment. The third part of the address dwelt on the characteristics of silvery pig containing from 11 to 15 per cent silicon and the manner in which it may be incorporated with advantage in various cupola mixtures.—*Pat Dwyer.*

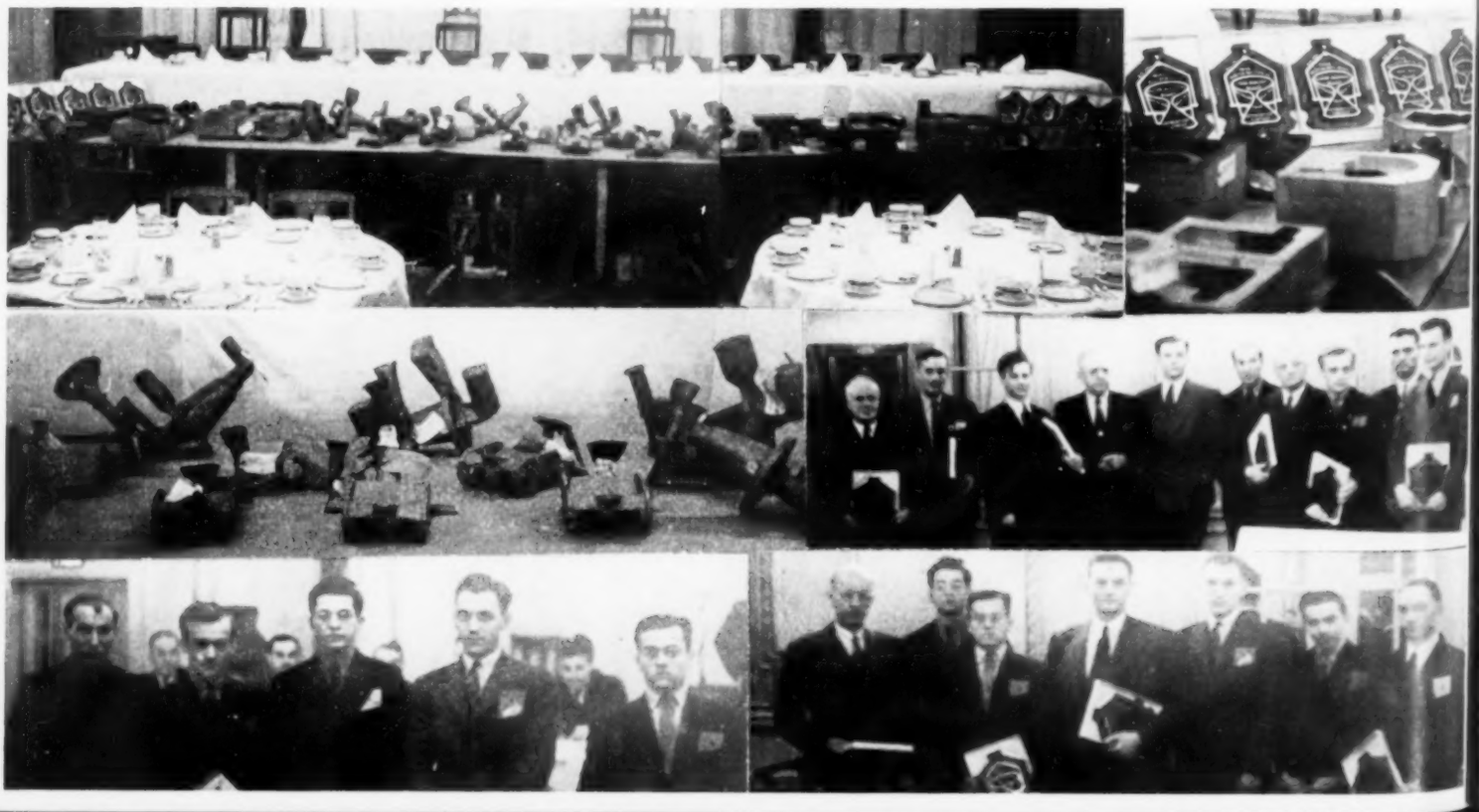
New England

SPEAKER at the regular monthly meeting of the New England Foundrymen's Association, held at the Engineers' Club, Boston, Oct. 8, was Charles Schureman, service engineer, F. E. Schundler & Co., Inc. There were 90 members and guests present.

Mr. Schureman's subject was "Synthetic Molding Sands, Problems and Solutions." He explained that there are eight main problems in connection with the subject of synthetic sands and he discussed each one in detail. 1. The selection of a base sand as to size and shape depend largely on the size of and finish required on the casting. 2. The bonding clay. Three types of

(*Continued on page* 112)

One of the features of the October meeting of the Northeastern Ohio Chapter was the presentation of bronze placques to firms whose apprentices won recognition in the local and national contests. Photos courtesy of Sterling Farmer, Sand Products Corp., Cleveland



With your foundry going great guns for Defense, you need the services of *all* your workers . . . and *they* need the safest and most comfortable protection for their work.

. . . Protect their eyes with AO Goggles.* American Ful-Vue Goggles, shown on the worker at the right, are good-looking, light, cool, comfortable. The goggles are equipped with American Optical Super Armorplate Lenses which screen out ultra-violet rays, absorb heat, resist flying particles.

. . . Protect their hands and fore-arms with AO Safety Gloves and Mittens made of high quality asbestos and chrome-tanned leather, double-stitched and reinforced at vital points.

. . . Protect their ankles and legs with AO Safety Leggings and Spats—made in asbestos, chrome-tanned leather and fire-resistant duck . . . snug, comfortable, easy to put on and off.

Your AO Safety Representative will help you plan an effective, economical head-to-ankle Safety Program. Call him in today.

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American Optical Company

Southbridge, Massachusetts

PATENTED

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(*Continued from page* 110)

clays are available, kaolin or fire clay type, western bentonite, and southern bentonite. Here again the size, shape and weight of the casting determine which clay would be used. 3. Mixing, where possible a batch type or muller type mixer is very beneficial. In this connection, he stated that the best method of keeping up the volume of the heap was to add a mixture of mulled old heap sand, with sharp sand if necessary, and clay bond. 4. Control of heaps. Various control tests were recommended, but the hot test is considered most essential. 5. Casting finish. This is controlled largely by grain size. 6. Moisture control. That is necessary and it is helpful to keep the moisture as low as possible. 7. Expansion of sands. Silica sand grains being susceptible to expansion under temperature exert pressure on the surface of the mold and cause much trouble if no means is provided to relieve that condition. One hundred mesh hardwood flour used in the sand mixture, change in the amount of clay, faster pouring, change in grain size, increase in size of gates, use 1 per cent cereal binder and softer ramming, are all antidotes for troubles arising from silica grain expansion. 8. Disadvantages of synthetic sands are that they dry out rapidly and give molds which are difficult to patch and finish.

Use of synthetic sand is cheaper and can be used successfully to produce uniform molds and continuous sound castings. A general discussion followed the address and many questions were put to the speaker who was most helpful in answering them.

Regular monthly meeting of the New England Foundrymen's Association was held at the Engineers' club, Boston, Nov. 12, and was attended by 100 members and guests. Following dinner, Charles O. Butler, president, announced that at a meeting of the executive committee of the association, it was voted to hold a New England foundry conference in the spring of 1942. Walter Saunders Jr., Walter Saunders & Co., Providence, R. I., was chosen chairman of the conference committee. President Butler also announced that plans were underway for the annual meeting of the New England Foundrymen's Association which would be held Jan. 14, 1942. He then introduced Dr. Leonard Guenther, a noted German refugee who presented an interesting coffee talk on the subject, "I Saw Hitler's Uprising".

The technical session consisted of a fine address by Max Kuniansky, general manager, Lynchburg Foundry Co., Lynchburg, Va., who spoke on "Gray Iron Founding Operation". Mr. Kuniansky, who is a recent recipient of the W. H. McFadden gold medal of the American Foundrymen's Association, discussed general foundry and metallurgical practice as carried out in his plants at Lynchburg and Bradford. He explained that one of the principal products of the company was pipe which was cast centrifugally in water cooled metal molds. Loam molding, which is becoming more and more a rare art, is carried out in one division of the plant. Among other difficulties to worry the foundryman, he mentioned the problem of where the future molder would be obtained and the present impossibility of many foundries to obtain good scrap. His particular practice involved the manufacture of a so-called synthetic pig iron by melting and pigging a 100 per cent steel charge in the cupola. That gives a material of approximately 2.80 per cent total carbon which in turn is remelted and pitch coke is used to obtain the required resulting carbon. Alloys are used in the form of briquets in the cupola and late additions in the ladles.

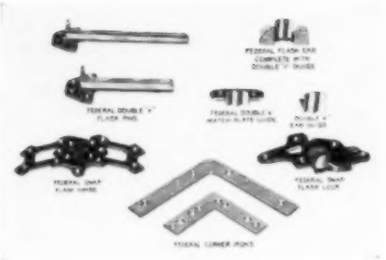
A chill test is run on every ladle poured and in this connection he pointed out that a constant temperature of pouring the test is necessary to obtain chill tests which mean something. Physical tests and frequent analyses are run to insure good control. The general pouring practice at that shop is to tap hot and pour relatively cold. The phosphorus is kept low as this is necessary to facilitate carbon pickup. A mixing ladle is used and desulphurizing is the regular practice. He also discussed in detail the use of risers and stated that in their practice, they were able to keep the number of these down to a minimum. Mr. Kuniansky presented his paper in his usual pleasing manner and a good discussion period at the end of the address contributed to a most interesting and profitable evening.—*M. A. Hosmer.*

N. Ill.-S. Wis.

APPROXIMATELY 60 foundrymen were present at Hotel Hilton, Beloit, Wis., on Oct. 14, to hear Ralph C. Kresge, personnel director, Link-Belt Co., Chicago, talk on, "The Foreman's Part in Personnel Work." Chairman of the chapter, G. W. Minert, introduced the speaker. Mr. Kresge gave an interesting and enlightening talk on the foreman's responsibility in personnel relations and the top-management's responsibility in making that part of his job easier. He brought in several points on job evaluation, rate-setting, etc., as a method of keeping foundry employes satisfied with wages. He mentioned as a concrete example that the Link-Belt foundry has evaluated 53 different jobs each of which carries a minimum and maximum wage rate determined by an evaluation of the education and experience and skills necessary. About 45 minutes of discussion followed during which Mr. Kresge answered many questions on the subjects of job-evaluation, merit rating of employes and the precautions used to eliminate

(*Concluded on page* 115)

View at the left taken at the Oct. 14 meeting of the Northern Illinois and Southern Wisconsin Chapter shows, left to right—George Minert, Gunite Foundries, Rockford, Ill.; R. C. Kresge, Link-Belt Co., Chicago, and H. L. Klopf, Fairbanks-Morse Co., Beloit, Wis. View at the right taken at the Oct. 17 meeting of the Wisconsin Chapter meeting shows, left to right—A. C. Ziebell, Universal Foundry Co., Oshkosh, Wis.; Carl Taylor, Wisconsin Building & Loan League, Milwaukee, and Harry Ladwig, Allis-Chalmers Mfg. Co., Milwaukee. Photos courtesy of John Bing, A. P. Green Fire Brick Co., Milwaukee



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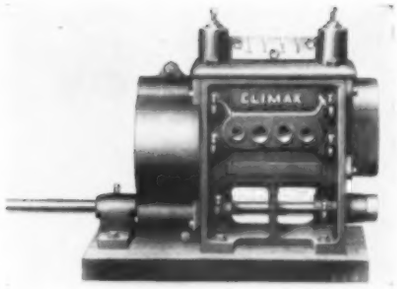

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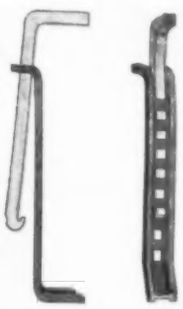

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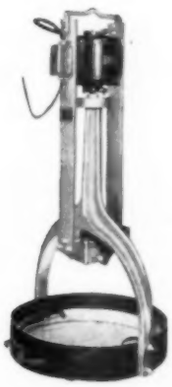

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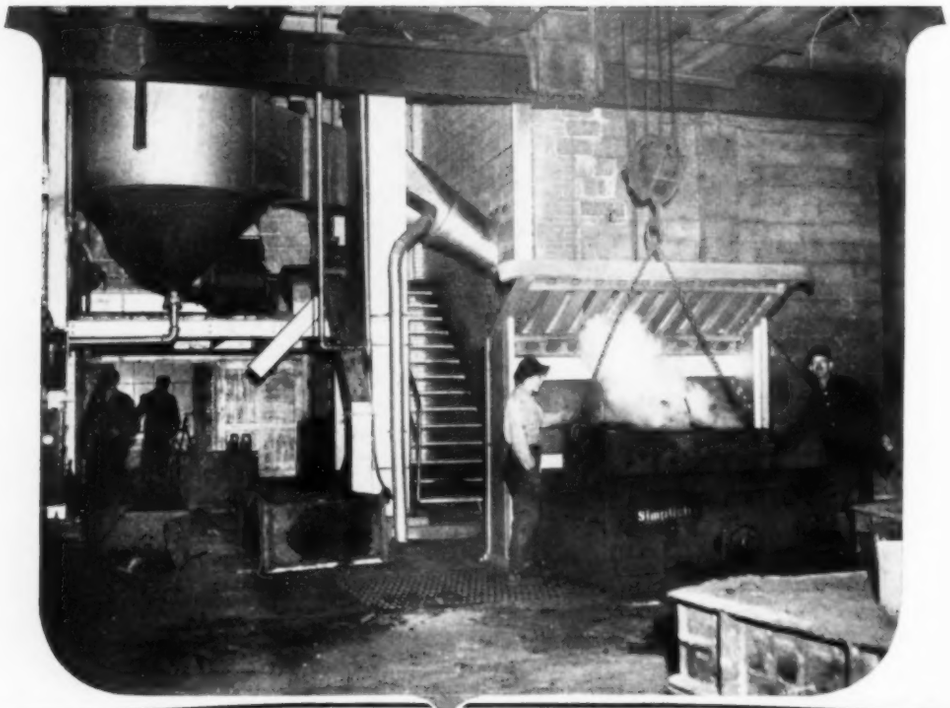

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(*Concluded from page* 112)
errors and partiality.

John Claussen, membership chairman, initiated a membership drive and named Bill Goff, B. L. Baptist, Leonard Larson and Roy Baysinger to the membership committee to assist him.

Approximately 60 members and guests of the Northern Illinois-Southern Wisconsin Chapter were present Nov. 11 to hear H. O. Quartz, welding engineer, Allis-Chalmers Mfg. Co., Milwaukee, talk on "Welding Cast Iron." The meeting was held at the Faust Hotel, Rockford, Ill., Chairman George W. Minert presiding. H. S. Simpson, National Engineering Co., Chicago, and president of the A.F.A., spoke briefly on the casting promotion campaign which is getting under way, and C. E. Westover, executive vice president of the association, talked on membership.

Mr. Quartz told of the development of welding applied to cast iron dealing with the past 20 years especially. He said that a welded casting can be guaranteed to be equal to one that has not been welded, and that if it cannot, welding is a waste of time. In the case of large castings, a great deal of trouble is justified to save them. Naturally no foundry welds any more of its new castings than is absolutely necessary, but often in the case of broken or worn castings in the field, welding will save costly shutdowns and both time and material in getting a machine back on the job. He mentioned an extreme case in which 1200 pounds of metal had been deposited in a weld. He also mentioned corroded turbine housings repaired 17 years ago which have operated ever since with no apparent further deterioration. After a short discussion period, the meeting was terminated by a rising vote of tribute on Armistice day to the soldiers of the last war.

Next meeting will be the Christmas party at the Faust Hotel, Rockford, Ill., on Dec. 5. Tickets are on sale and must be purchased before Dec. 3.—*J. R. Cochran, technical secretary.*

Nor. Iowa

SECOND regular meeting of the Northern Iowa Foundrymen's Association was held at Black's Tea Room, Waterloo, Iowa, on Oct. 28; with approximately 60 members and guests present. Speaker of the evening was R. E. Wilke, metallurgist, Deere & Co., Moline, Ill., who presented an informative talk on the "Properties and Control of Molding Sands".

Mr. Wilke brought out very clearly the influences of permeability, strength, moisture, hot strength, flowability, deformation, etc., on the quality of castings and the casting finishes produced, and told how the various properties of molding sands could be controlled. Particular emphasis was laid on the behavior of various molding sands under the fusion, strength, and deformation between the results of such tests and casting defects such as scabbing, burning-in, etc., were clearly pointed out by the speaker. A lively discussion followed Mr. Wilke's talk.

An interesting film, "The Goose Lake Fire Clay Deposit", was presented by the Illinois Clay Products Co. at the close of Mr. Wilke's talk. The film showed the mining and manufacturing method used at the Goose Lake fire clay and fire brick plants.—*F. R. Snyder, secretary.*

Toledo Foundrymen Hold Meeting

Approximately 70 foundrymen from Toledo and vicinity held their third meeting at the Hillcrest Hotel, Toledo, O., on Oct. 31. Victor Zang, Unitcast Corp., Toledo, presided. He introduced R. E. Kennedy, national secretary, A. F. A., who brought greetings of the national officers and spoke briefly on the aims and value of membership in the association. Harry W. Dietert, Harry W. Dietert Co., Detroit, was the principal speaker of the evening, and discussed the control of molding and core sands. He pointed out that grain size and bonding power were important characteristics of sands which could be controlled to give various desired properties.

Apprentices Meet

Second meeting of the apprentice training course sponsored by the Birmingham District Chapter of the A.F.A. was held at the Tutwiler Hotel, Oct. 24, with approximately 75 present. An excellent question and answer period followed the talks. Lynn Ogden, Stockham Pipe Fittings Co., made a good talk on small dry sand cores and brought a number of specimens with him, including hand grenades, navy bombs the smallest fittings Stockham makes, and the cores used in making those castings. Paul Townes, American Cast Iron Pipe Co., followed with a fine talk on medium size dry sand cores, with slides to illustrate. J. V. Davis, United States Pipe & Foundry Co., discussed large dry sand cores which he illustrated with drawings of the core for a 84-inch, 70 per cent bend fitting, which that company expected to pour the following day.—*T. H. Benners Jr., chairman, apprentice training course committee.*

BRITISH FOUNDRY GROUPS FORM NATIONAL COUNCIL

AN INTERESTING development has taken place in the ironfoundry industry of Great Britain. National representation of the industry has been achieved through the formation of the Council of Ironfoundry Associations. Until this event had taken place, manufacturers of iron castings were organized into a number of trade associations, which shall continue in existence and preserve their autonomy.

Heavy castings made in engineering and in the larger jobbing foundries are the concern of the National Ironfounding Employers' Federation, which comprises a number of local associations distributed over the country. Light castings and rain water goods are the concern of the British Ironfounders' Association. The National Malleable Ironfounders' Association takes care of malleable castings. Then there are a number of sectional associations concerned with specific products, such as baths, cast iron chairs for railroad tracks, cast iron axle boxes, cast iron pipes, malleable tube fittings, ingot molds, rolls, flushing cisterns, etc.

The Ironfounders' National Confederation is an organization that caters for those foundries which, for various reasons, find that the other associations do not meet their requirements. All these associations are responsible for the trade interests of their members, each in its particular sphere. They are not concerned with wages or conditions of labor which are catered for by separate organizations.

The technical, research and educational aspects of the industry are represented by the British Cast Iron Research Association and by the Institute of British Foundrymen.

Until recently, these various associations each dealt with the particular interest of their own members, without much intercourse with one another. As a result, there was no organization which properly represented the interests of the industry of iron castings as a whole. This created a difficult situation when questions concerning the industry, irrespective of its sectional interests,

had to be taken up in connection with war production.

The position was all the more unfavorable as the Ironfoundry industry came under the Iron and Steel Control for all matters concerning supplies of most raw materials, allocation of contracts, competitive production against fabricated steel, etc. In fact, there was no organized body that could speak for the industry as a whole. This was unsatisfactory both for the industry and for the government departments that could not properly discuss the same problems of general interests with representatives of a comparatively large variety of organizations.

That defect now has been remedied by the formation of the Council of Ironfoundry Associations, which comprises the great majority of existing associations responsible for the bulk of the national output of iron castings, with a view to representing the industry in negotiations with the government and other constituted bodies. It will also play its part in the solving of post-war problems, both nationally and internationally. Sectional interests will continue to be covered by the individual associations.

The two technical organizations are affiliated to the Council. Another affiliated body is the Engineering and Allied Employers' National Confederation, which deals mainly with questions of labor in connection with engineering firms; it includes many engineering foundries and for this reason gives its support to the Council.

At the first general meeting of the Council held in London on October 1, FitzHerbert Wright, a director of the Butterley Company Ltd., Ripley, who was largely responsible for the formation of the Council was elected chairman. Vincent Delport, European editor of THE FOUNDRY and managing director of the Penton Publishing Company Ltd., who also took an active part in the organization, was elected secretary.

READER'S COMMENT

Readers are invited to comment upon articles and other editorial material appearing in THE FOUNDRY. The editors cannot publish unsigned communications, but at their discretion may permit a writer to use a pseudonym when a bona fide reason exists for withholding his identity. Letters should be brief.

THE EDITORS

Should Use Caution

TO THE EDITORS:

On page 54 of the September, 1941 issue of THE FOUNDRY, occurred an article, "Why Sulphur Pick-Up Varies in Cupola Iron," by Roy A. Clark, which presented a case against foundry coke as the chief malefactor in this regard. A study of the data presented and a consideration of other factors not mentioned, however, will not justify the conclusions drawn.

In the first instance the cokes shown with a range in sulphur contents from 0.53 to 0.66 per cent can be regarded as very good in this regard, in fact about the best. In the second instance the breakdown of the "fixed" (0.003 to 0.06 per cent) and "volatile" (the author undoubtedly means "combustible") sulphur looks very unusual with the "volatile" sulphur reported too high, and further the assumption that all of this "volatile" sulphur is necessarily absorbed by the iron does not square with the facts.

Our experience has shown that for normal cupola operation (coke ratios from 6.5:1 to 9:1) we can expect a sulphur pick up from coke (0.55 per cent sulphur) of about 0.02 to 0.04 per cent. This can be increased, however, by an increase in coke, an increase in the sulphur in the coke, poor scrap, and an improper slag. In the examples shown in the article, the sulphur absorption is respectively 0.07, 0.044, 0.065 and 0.069, which is considerably higher than 0.02 and 0.04 per cent.

In the final sulphur balance in three instances even when all of the "volatile" sulphur is added to the iron, there was not enough to account for the total sulphur in the iron. The assumption that all of the sulphur is absorbed by the iron is obviously incorrect, for it allows no sulphur absorption by the slag, which if true is the fault of the slag composition and balance rather than the coke. The author's explanation that the shortage can be accounted for by the sulphur absorption through the bed coke is not tenable, for the bed coke during the heat was originally the charge coke, and this has already been accounted for; if it refers to the original bed coke consumed then the length of the heat governs. Dudouet (A. F. A., Vol. 56 page 546) states that the amount of sulphur absorbed by the iron in contact with the hot coke would amount to about 0.0025 per cent when using a 1 per cent sulphur coke.

As MacKenzie (paper presented before Institute of British Foundrymen, 1928) points out, "Sulphur increases (in the iron) with the sulphur of the coke, all other things being equal," and further, "Carbon and sulphur are mutually repellant. A high sulphur iron is difficult to carburize and on the other hand a low carbon iron absorbs sulphur readily."

O'Neill and others (A. F. A. Vol. 56, page 202) have also shown that in general the sulphur absorption by iron from the coke is proportional to the total sulphur in the coke and their attempt to correlate the "combustible" sulphur with the rate of absorption was unsuccessful.

Sulphur can occur in coke in several forms principally as sulphides, sulphates, organic (combined as hydrogen, carbon complexes) and possibly free sulphur. It is true that the amounts of each of the above can vary in different cokes, but to assign the full responsibility to the coke for the instances noted disregards any operation influence which may affect this factor to an even greater extent. A siliceous or acid slag, for instance, seriously interferes with the ability of the limestone to absorb sulphur; excess quantities of oxides absorbed by the limestone flux also reduces its effectiveness. Excessive oxidation due to a low coke ratio or excessive air, can cause a serious deterioration of the flux in removing impurities from the metal. These factors all relate to operation and are independent of coke quality. It must be remembered that a cupola is an oxidizing melting process (unlike a blast furnace) and is unbalanced easily to cause unfavorable reactions if all operating factors are not watched carefully. In the instance of the mix used containing 80 per cent steel approximately 100 pounds of coke charged would be required to furnish the carbon absorbed by the metal in melting, and if only 500 pounds coke per charge were used this would leave only 400 pounds of coke to melt 5000 pounds of metal, or a ratio of 12.5 to 1, a dangerously low amount.

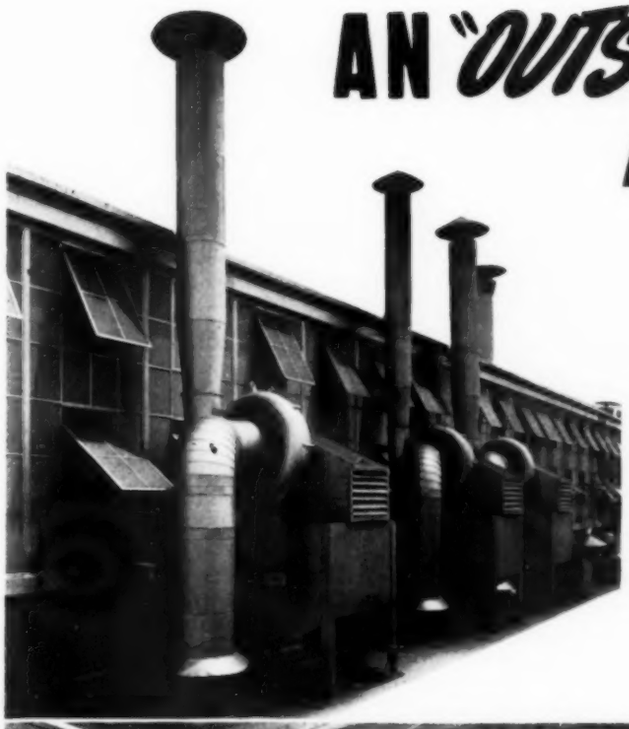
Stigma Is Unwarranted

In the writer's opinion the stigma attached to coke in connection with sulphur absorption as shown by this article, is unwarranted and unsubstantiated. Such a direct attack is dangerous in its inference and responsibility. In effect it says, "You can't do a thing about controlling the sulphur in your iron. Coke is the sole responsible factor." Such an attitude stifles any attempt to employ one of several means, already an inherent part of the cupola melting process, to restrict the absorption of sulphur.

This criticism is not directed to discourage investigational work of this nature (too little is really being done) but rather to sound a word of caution in drawing premature

(Concluded on page 118)

AN "OUTSIDE" ROTO-CLONE APPLICATION MADE NECESSARY BY "INSIDE" SPACE LIMITATIONS



The collection of fine floating dust created by grinding and finishing operations in the Reed Prentice Machine Tool plant, at Worcester, Massachusetts, is accomplished by an "outside" Roto-Clone installation shown top left. The views below were made in the finishing departments where rectangular grilled top tables are used for grinding and finishing operations. Complete information on the application of Roto-Clone to all types of industrial and foundry dust control is available without obligation. Write for Type D Roto-Clone Bulletin (covering dry dust collection) No. 272, and Type W Roto-Clone (wet collection) No. 274-A.

Grinding and finishing dust is pulled through the grilled table tops and conveyed through ducts in a pipe trench to Roto-Clone precipitators outside of building. Under-floor ducts are also connected to the grinding stations seen at the extreme right.

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(*Concluded from page* 116)
conclusions from isolated causes. The value to the industry lies only in their general applicability.

B. P. MULCAHY
Research Engineer
Citizens Gas & Coke Utility
Indianapolis

Cast in Spain

TO THE EDITOR:

The accompanying illustration shows a church bell made in Spain, which has been modernized to some extent by mounting it on ball bearings and giving the surface a new appearance by sandblasting and brushing. In the smooth space between the two top rings it bears the inscription: Santa Teresa De Jesus; and in the clear space below HDA (Hacienda) Santa Teresa Ano De 1920. These inscriptions have been stamped with stencils and may or may not be a true indication of the date of casting the bell. The bell probably is much older and these inscriptions were stamped when it was installed at the Hacienda de Santa Teresa.

When the Hacienda de Santa Teresa was confiscated several years ago along with all the other large properties in the Laguna district of Mexico, the bell was brought to Torreon and hung in one of the church towers. Some time ago the Padre sent it to me to have it mounted in a yoke so that it would swing. Later the original yoke was found in the abandoned tower on the hacienda. It was brought in and I repaired it in the original form and installed ball bearings on the ends of the axles. Now it is in place on a new tower in El Temple Del Carmen in this city.

Apart from the yoke this 275 pound bell is a fine piece of foundry work and has a good tone. The makers coat of arms on the front face reads:

Hijos de Murua	Sons of Murua
Real	Royal
Patente	Patent
De	of
Invencion	Invention
Vitoria	Victoria

The rings were cast on the bell, but the ornamental figures above and below, also the coat of arms were put on later, I should like to know how this was done, probably by a process covered by the patent. I inquire merely through curiosity since I have no intention of attempting the process. Could you throw any light on this point.

In the past months I have made several bells ranging in weight from 250 to 1900 pounds. I am now facing two small altars in one of the churches with brass. Same church for which I made the communion rail some time ago, a very artistic job and the Padre is quite proud of it. Outside this ecclesiastical work I have more work than I can take care of in my regular line of castings for mines, smelters and other industrial plants.

H. H. MILLER
Torreon, Coah., Mexico

Editors' Note: Very likely the ornamental items were brazed on the bell. This is quite common practice.

Church bell cast in Spain

Obituary

Dr. Frank A. Fahrenwald, 53, president, Fahralloy Co., Harvey, Ill., was killed Oct. 13 when his automobile was struck by a train in Chicago.

* * *

William F. McAfee, 63, assistant to the president, International Harvester Co., Chicago, died in Washington Oct. 17. Mr. McAfee, who joined the organization more than 30 years ago as a salesman, had been stationed in Washington recently as acting head of the company's armament production activities.

* * *

Henry Newton, 77, who retired in 1937 after 48 years service with the Brown & Sharpe Mfg. Co., Providence, R. I., died Oct. 30 in that city. Mr. Newton served in the advertising and small tool departments for a number of years, and had charge of foundry sales.

* * *

Edward Whitehead, 76, chairman, Whitehead Bros. Co., New York, died Oct. 18, at his home in South River, N. J., after a long illness. Mr. Whitehead was born at South River in 1865, the son of Charles W., and the grandson of Samuel Whitehead, who was a founder of the company in 1841, 100 years ago. He became affiliated with the company in 1890, as assistant to his father, who was in charge of production at the company's North Jersey works. When his father died in 1904, Mr. Whitehead took charge of production, a responsibility he held for a number of years, even after he had become vice president in 1916. In 1904 he also became a director. Subsequently he assumed charge of the real estate affairs of the company, and in 1929 became chairman of the board.

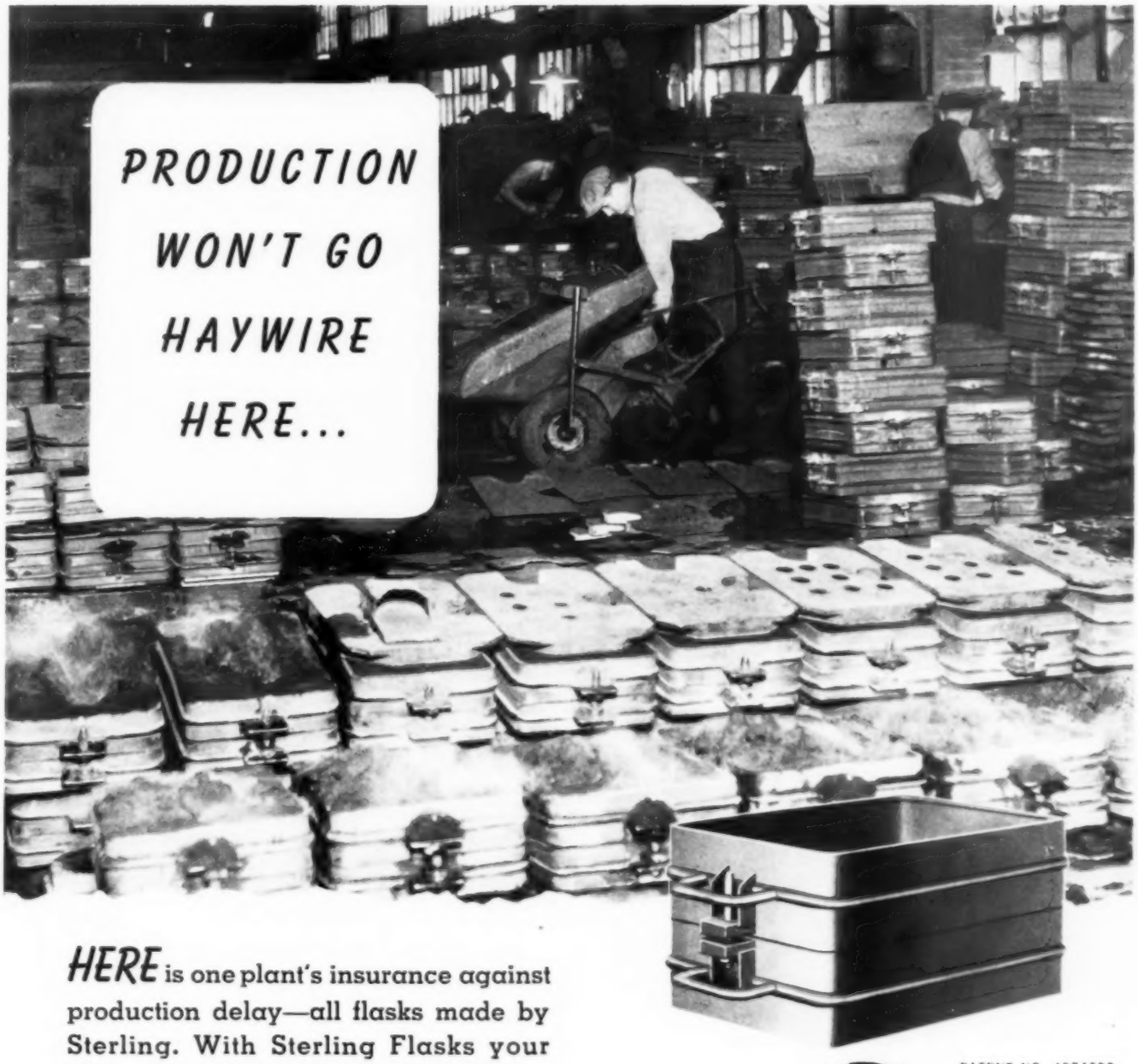
* * *

Joseph B. Sessions, 59, president and treasurer, Sessions Foundry Co., Bristol, Conn., died Nov. 1 in the Hartford hospital, Hartford, Conn., following an operation. Mr. Sessions had been with the foundry company, founded by his father and grandfather in 1879, since his early youth. He started as pattern clerk, and later became successively assistant secretary, vice president and treasurer, and, upon the death of his father several years ago, president. He attended Wesleyan University, and prior to that went to Taft preparatory school. Mr. Sessions also former treasurer of the Sessions Clock Co., Forestville, Conn., of which his brother William K. Sessions, is president, and was former president of the Bristol Trust Co.

* * *

J. W. Kirkman, 55, general superintendent, Harrison Steel Castings Co., Attica, Ind., died Oct. 31. Mr. Kirkman began as an apprentice in coremaking at the age of 12, with the Hinson Herford Steel Casting Co., Converse, Ind., under the supervision of J. W. Harrison. That company later changed its name to the National Car Coupler Co., and still later to the Harrison Steel Castings Co. When Mr. Harrison went to Attica to establish a foundry in that city, Mr. Kirkman moved also, and helped in the construction of the Attica plant. When production began in May, 1907, he started as a molder on the floor. The knowledge he gained as a coremaker and molder merited his advance to foundry superintendent in 1914. Later he was made general superintendent, which position he held at the time of his death.

Engineering Extension department, Purdue University, Lafayette, Ind., recently published a 62-page bulletin entitled, "Personnel and Industrial Relations Problems in the Defense Program" which comprises the proceedings of the Personnel and Industrial Relations Institute held at the university during May 15 and 16.



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MOBILIZE AGAINST CARELESSNESS

By H. H. SLAWSON

ALARMING increase in accidents which kill or disable workmen in practically every field of industrial activity added serious significance to the deliberations of the thirtieth annual National Safety Congress in Chicago Oct. 6 to 10.

From the picture drawn by numerous speakers, it is evident that responsibility for the sharp rise rests partly on the shoulders of new, inexperienced men, rushed into industrial plants without adequate training in accident prevention work. But management, too, was blamed, because in the imperative need to produce war machines at top speed, executives, it was charged, feel that time, money and men can be used better than in promoting safety campaigns.

Col. John Stillwell, president of the National Safety Council, in his address opening the convention, disclosed that from Jan. 1 to Sept. 1 of this year industrial accidental deaths are up 6 per cent over 1940 losses, and all accidental deaths are higher by 3 per cent.

"We must contemplate, then," said Col. Stillwell, "a possible death toll for this entire year of 100,000 lives, or 3,500 more than were lost in 1940. The probable economic losses will be some $3,600,000,000. This situation is directly responsible for slowing up our defense preparations."

Accidents Are High

Secretary of the Navy Frank Knox, in addressing the convention later, interpreted the facts further, in pointing out that strikes in defense industries during 1940 caused the loss of 6,700,000 days of work, but that accidents cost 26,800,000 days or four times as much lost time. This, he asserted, would have been "sufficient to build 45 battleships, or 375 destroyers, or 450 submarines, 195,000 light tanks, 12,500 trainer planes, 75,000 fighter planes, 30,000 medium bombers, or 15,000 heavy bombers."

Col. Stillwell proposed a three-point program to curb accidents; this to include organization of public support in an "Enlist For Safety" campaign; a study of new emergency problems to discover and apply appropriate remedies; and "mobilization of all our strength to defeat the steady pressure for diversion of safety budgets and manpower to other uses."

For discussion of accident problems peculiar to foundry operations a round table conference was arranged, which occupied an entire afternoon. Some seven different topics were discussed informally foremost of which was a foundry superintendent's statement that "You can't operate a foundry without lost-time accidents like you can a machine shop or pattern shop—there are too many hazards."

Other topics discussed included the following: How can you interest a foundryman in safety? When is a foundry safe from a health standpoint? What is a safe atmosphere? How can you get a workman to wear a respirator all day in hot weather when he is perspiring and has difficulty breathing? What type of goggles is best suited for pouring iron? Rough grinding? General foundry work? Where does safety education stop? On what safety activities should we concentrate to secure results?

Experts Answer Questions

Serving on the panel of experts who handled these and other questions were the following six men: J. P. Boaden, safety director, Union Malleable Iron Co., East Moline, Ill.; C. J. Brinkworth, foundry superintendent, Link-Belt Co., Indianapolis, Ind.; M. W. Dunmore, production manager, Beloit Iron Works, Beloit, Wis.; J. William Fehnel, chemist, Industrial Hygiene Laboratory, Metropolitan Life Ins. Co., New York City; E. O. Jones, personnel director, Belle City Malleable Iron Co., Racine, Wis. and C. A. Sholly, safety director, Sibley Machine & Foundry Corp., South Bend, Ind.

Other problems of concern to foundrymen and industrialists generally received lengthy consideration in the various sessions of the safety congress.

In another sectional conference, devoted to "Dust, Fumes, Gases and Vapors," S. W. Gurney, laboratory director for Liberty Mutual Insurance Co., Boston, asserted that, although there are delicate and precise measuring instruments available for detecting the presence of dangerous dusts and vapors, the eyes and nose of the safety director can be trained to perform the measuring function satisfactorily.

"It is not always necessary to know the presence of dust particles in terms of 'parts per million,' to know if the air is unhealthy, or at least unpleasant for the workman," said Mr. Gurney. "If the safety engineer can see dust floating in the air near the workman, he can be pretty sure it is none too healthy or pleasant for the workers. There are many more dust particles than can be seen and the workman is breathing them during his entire working day. The same is true of invisible fumes and vapors. . . . . I don't believe it is good industrial policy to ask a workman to stay all day in such unpleasant conditions even though no particular health damage is provable."

R. J. Greenly, chief of the training division, Carnegie-Illinois Steel Corp., Pittsburgh, pointed out that accident rates during the first year of employment are usually twice the rates in subsequent years. He suggested that safety promotion work should be concentrated among this high-accidental group of new and inexperienced workers who have deficient knowledge of safe practices and lack skill.

"Safety training should begin at the applicant's first contact with the plant. The training should be repetitive and as nearly continuous as practicable. For best results it should be given on the job, at the machine where the man works. Subsequent training in groups should be stimulating and not boring. New employees can be easily and quickly taught safe habits, if appropriate, concentrated effort is directed toward that end."

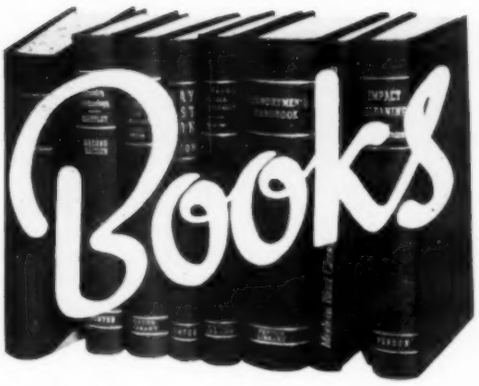
Advocates Prevention Measures

Scientific research in safety can advance accident prevention, Dr. R. W. Cairns, director of Hercules Powder Co. Experiment Station, Wilmington, Del., declared. He found fault with the "statistical approach" which depends on development of adverse experience by noting where accidents have occurred in the past and predicting where they may occur in the future.

"The alternative method," he continued, "is the experimental approach, in which the attempt is made to establish the conditions leading to accidents and eliminate the most serious apparent causes before the accidents happen. . . In contrast to the cost of accidents that do happen, research on methods of prevention is cheap."

Professor V. S. Karabasz, University of Pennsylvania, Philadelphia,

(*Concluded on page* 122)



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TALES FROM THE GANGWAY

450 pages, 59 chapters, $1 postpaid. This book is a collection of the early chapters of Pat Dwyer's rollicking foundrymen, told in an exceedingly readable style. As practical as it is readable, this book tells the foundryman many practical things, including; the making of gears, open sand plates, sheave wheels, large pots, blast furnace coolers, winding or hoist drums, furnace stand pipe connections, long columns; core-making, etc. Originally sold for $3, this book is filled from cover to cover with down-to-earth, practical suggestions. If there is a foundryman who does not already have this book he is missing one of the most readable and usable books ever written.

REFINING METALS ELECTRICALLY

414 pages, 55 illustrations and 50 tables, $2 postpaid. This book, reduced from $6, covers the theory and practice of melting in the electric furnace. Gives helpful data on size selection, type to use, economy in operation, advantages and limitations, installation, maintenance, etc. A fully practical book in which history and background are presented to provide the reader with all data necessary in installation, operation and maintenance.

MODERN BLAST CLEANING AND VENTILATION

213 pages, 38 illustrations, $4 postpaid. This book, by C. A. Reams, engineer of Ford Motor Co., brings latest and most approved methods of casting cleaning to foundrymen in plain language. It is full of completely practical suggestions and proved methods and practices. Application of cleaning methods discussed will eliminate many objectionable cleaning room practices. Full information on abrasive selection and use is included. Practical foundrymen report this book worth many times its cost.

GRAY CAST IRON

383 pages, completely illustrated, $5 postpaid. John W. Bolton, recognized foundry authority has collected and compiled in readable form all recent information on this subject, so presented that it is extremely usable. Includes latest information on structural metallurgy; engineering and physical properties, melting processes; casting defects; effects of regular and alloying elements; superheating; heat treatment; machinability and wear; effect of temperature on mechanical properties; corrosion, and specifications. This book is a "must" in every progressive gray iron foundry.

FOUNDRYMEN'S HANDBOOK

310 pages, fully illustrated, $3 postpaid. This book, reduced from $6 because some specifications are now out of date, has long been a standard reference book among foundrymen. It is a complete compendium and handbook covering every branch of foundry work from estimating the price to cleaning finished castings. If you do not already own a copy of "Foundrymen's Handbook" your working tools are incomplete.

IMPACT CLEANING

480 pages, 256 illustrations, $7 postpaid. Wm. A. Rosenberger is a recognized impact-cleaning engineer who has gathered together all important information on the subject and presented it in readily understood form. Every foundryman knows that cleaning costs can eat up profits. This book shows both theoretical and practical ways to reduce cleaning costs to a minimum. It presents the "how and why" of high cleaning costs and shows exactly the methods to be used in their reduction. No foundryman responsible for either quality production or satisfactory earnings should be without this book.

GATES AND RISERS FOR CASTINGS

373 pages, fully illustrated, $3 postpaid. This is a practical book covering completely and with authority a subject never before covered in book form. It is an encyclopedia of sound foundry practice supplying reliable answers to the ever present question, "How can casting defects be prevented?" Written for every foundryman from workman to owner.

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AMERICAN MALLEABLE CAST IRON

416 pages, 190 illustrations, formerly $7, NOW $2.50 postpaid. This book by H. A. Schwartz, completely covers history of the industry—its development, modern methods of manufacture, metallurgical principles involved and properties and uses. Also included is a detailed list of all important books and articles on the subject to date of publication. Written primarily for the producer and user of malleable castings, this book is also well adapted to needs of technical students and libraries.

MELTING IRON IN THE CUPOLA

240 pages, 126 illustrations, $2 postpaid. This book formerly sold for $5. Covers practically every phase of cupola construction, operation and maintenance. A thoroughly practical book. Suitable for the novice studying the cupola as well as the practical foundryman who operates it. Tables, formulas and a complete cross-index listing more than one thousand items makes this a valuable reference and practical work book.

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(*Concluded from page* 120)
urged greater appreciation of the need for well planned training in accident prevention. This training, he suggested, should accompany training in job performance and not be attempted as a separate course.

Responsibility for training falls on the foreman in most establishments, he pointed out. Consequently the training course should be geared to the foreman and should be aimed first at making them good teachers. Many foremen know exactly how to do the job but have little ability at teaching others to do it, he said.

"A fundamental in any training program," he continued, "is that telling is not teaching. The beginner is frequently told so much about his new job all at once that he becomes confused. In order not to appear stupid, he says he understands when he does not."

Issues Booklet

"Shall We Defend or Attack?" No. 41 of a series, being published by Farrel-Birmingham Co., Ansonia, Conn., recently has been issued. The booklet examines the logical outcome of both an offensive and defensive strategy of war, and sums up the national attitude regarding the subject.

Informs Inventors

Department of Commerce, Washington, has published a 22-page bulletin entitled "How Inventors Can Aid National Defense" which gives interesting information on that subject, and the procedure to be followed.

Has Birthday

Ashcroft Gauge division, Manning, Maxwell & Moore, Inc., Bridgeport, Conn., is celebrating its ninetieth birthday this year. Just 90 years ago Mr. Ashcroft built the first Bourdon tube pressure gage ever built in the United States. He saw the gage on exhibition in London in 1851, and obtained the rights to manufacture it.

Offers Service

Davenport Machine & Foundry Co., Davenport, Iowa, beginning January, 1942 will sell, and service all its molding machines from the Davenport, Iowa office and factory where an engineering sales and service department is being established to provide better service.

Adventures of Bill

(*Concluded from page* 80)
and made tracks for the back door. The casting weighed about a ton and a half and the gaffer yelled after him, 'There's one you can't throw in the river!' They had to knock the risers off and work over the top. The crane could not pull the mess out of the pit.

Now and then I been reading *Melting Iron In the Cupola*. There are some unusual but practical Q-blows described there. Bill mentioned one mounted on three legs and one that got stopped with eels. I mentioned one that had to be blowed by hand when the power was shut off. There was one up in Telluride years ago that melted her 9000 pounds per day. This Q-blow did not have any wind jacket. Air went into each tuyere through a system of canvas hoses wing nutted onto a sort of gland. The main canvas hose was connected to an old saw dust blower. I see the cup, saucer and spoon is mentioned in *Tales From The Gangway*. Nothing about the caged ball, the four leg horse and the double arm pulley with pulley ring and arms for pattern that the apprentice kept under his bed, evidence of skill and knowledge. The pulley in green sand is a neat little trick on account of the draft on the rim. The book also contains more information on gear molding wrinkles than any other foundry book. I am not familiar with all the methods described for making sheaves. However, one method with which I am familiar is omitted. Probably an oversight or just considered a variation, as it is quite simple.

"His reference to gears," Bill continued, "reminds me of an inquiry I had recently from a foundryman who wanted information on the equipment necessary for molding cast iron gear wheels with machine molded double helical teeth. One wheel is 16 inches diameter, one is 3 feet while the clutch pinion is 7 inches diameter. The face on each casting is 4¾ inches.

"Machine molded gears are made on a machine consisting of a revolving table, an upright member in the center and an arm attached to the tooth block containing two teeth. An indexing mechanism sets the tooth block in proper position for each tooth in succession around a circular cavity in the drag. Each tooth is rammed individually until the entire circle is completed.

"Lacking a gear molding machine, a wood ring is bedded in the bottom of the drag. Holes are bored in this ring and corresponding holes are bored in a wood arm terminating at one end in the tooth block and at the other end in an opening which allows the arm to slide back and forth on the spindle. A single arm serves for a straight tooth. Obviously a double arm, one above the other, is needed for a double helical tooth. The method is quite satisfactory on large wheels, but is not applicable in a practical sense to your small wheels and pinion.

"A practical solution of your problem is to make all the teeth in dry sand cores and then assemble the cores in either a green sand or dry sand mold made from a plain pattern disk. The corebox is a segment of a circle with the teeth pinned or screwed to the bottom. The pins or screws are removed after the corebox is turned over on a plate. The corebox is removed first in a straight lift, and then the individual teeth are removed.

"The number of teeth in the segment depends on the number required on the wheel. For example on the large wheel with 71 teeth, the segment corebox is laid off as one sixth of a circle with 12 teeth. Five full cores are made and then a stop-off block is placed in the corebox to stop off one tooth. On the smaller wheel with 32 teeth, the segmental corebox is provided with 8 teeth.

"The pinion could be molded in green sand from a pattern in four parts, top and bottom flanges, and main body parted at the center in a horizontal plane. The mold is made in a four part flask, drag, two cheeks and cope. The top part of the tooth section is removed with a spiral twist. Then the first cheek is removed and the second part of the pattern is removed.

"However, even for the pinion the core method is better and much faster. The teeth for each section are mounted in a corebox. The pattern is removed from the core as in the first instance. After they are dried the two half cores are matched by the teeth and lowered into a plain cylindrical mold bumped up on a molding machine. One of the principal advantages of the core method for all three wheels is that the cores may be blacked nicely and the joints neatly daubed."

Organizes Firm

The Harvey Furnace Co., 2935 St. Paul street, Baltimore, Md., has been organized by Harry D. Harvey to build metallurgical, melting and heat treating furnaces, core ovens, cupolas, and foundry equipment. He is also the representative of Floating Flame Inc., supplying powdered coal equipment for use in melting furnaces, heat treating, etc.

Index of foundry equipment orders for October, 1941, according to a recent report of the Foundry Equipment Manufacturers' Association, Cleveland, was 403.8 as compared with 363.8 in September. Index of orders for new equipment was 414.2 and for repairs 327.2. The index of 100 represents the monthly average of reported sales to metal working industries during 1937-38-39.

FOUNDRY ACTIVITIES

LINK TRACK ENGINEERING CO. has purchased Central Foundry Co., Vincennes, Ind. New owners will begin production of cast iron pipe and fittings by the first of the year, or as soon as machinery can be installed. Defense contracts will comprise most of the production of the plant. The property has eight acres and buildings, and much of the necessary machinery already is in place.

* * *

E. J. Scudder Foundry & Machine Co., Trenton, N. J., has let contract for an addition to cost $4000.

* * *

Western Steel Casting Co., Tacoma, Wash., was damaged more than $10,000 by a fire recently.

* * *

Coloma Foundry Co., Coloma, Mich., was destroyed by fire recently. Loss is estimated at $6000.

* * *

Penn Steel Casting Co., Chester, Pa. recently was damaged by fire to the extent of $500,000.

* * *

Keeler Brass Co., Grand Rapids, Mich., has let contract for a warehouse addition.

* * *

Massey-Harris Co. Ltd., Toronto, Ont., is planning plant alterations to cost $35,000.

* * *

Pittsburgh Steel Foundry Corp., Glassport, Pa., has had additional facilities to cost $410,000 approved by the Defense Plant Corp.

* * *

Callander Foundry & Machine Co., Guelph, Ont., will build a foundry addition 90 x 118 feet, to cost about $30,000 including equipment.

* * *

Quality Foundry & Mfg. Co., 2707 East Twenty-sixth street, Los Angeles, is building an addition to its plant.

* * *

Dock's Foundry, Three Rivers, Mich., has awarded contract for an addition to its plant to Frank L. Shoemaker, Sturgis, Mich.

* * *

Taylor-Wharton Iron & Steel Co. recently installed a new electric melting furnace at its High Bridge, N. J. plant for the production of manganese steel. With this installation the plant now is on a 100 per cent electric steel making basis. The new furnace and equipment installed at a cost of approximately $50,000 will be an important factor in conserving ferromanganese.

* * *

Dominion Foundries & Steel Ltd., Hamilton, Ont., is planning a plant addition to cost approximately $100,000.

* * *

Jamestown Malleable Iron Co., Jamestown, N. Y., is building a foundry addition to cost about $40,000.

* * *

Midwest Foundry Co., Coldwater, Mich., is erecting a concrete addition, 60 x 120 feet to its foundry. George W. Gaw is superintendent of the foundry.

* * *

Ace Mfg. Co., 6460 Benham road, Detroit, has been incorporated with $100,000 capital to manufacture castings by Roy J. Owens, 5048 Iroquois avenue.

* * *

Clare Bros., 216 King street, Preston, Ont., is having plans prepared for a plant addition which will require machinery, converters, etc. Cost about $40,000 with equipment.

* * *

Frost & Wood Co. Ltd., Chambers street, Smith Falls, Ont., has let contract for the construction of a two-story plant 80 x 110 feet to cost $25,000.

* * *

Columbian Bronze Corp., 216 North Main street, Freeport, N. Y. has let contract for the construction of a bronze casting plant to cost about $60,000.

* * *

Canadian Westinghouse Co. Ltd., 228 Sanford avenue North, Hamilton, Ont., will build a three story 100 x 600-foot addition to its plant to cost about $250,000.

* * *

Oregon Steel Foundry, 2515 Northwest Twenty-eighth avenue, Portland, Ore., recently was damaged $20,000 by fire. The company employs 30 men and was working on defense orders.

* * *

Rogers Pattern Foundry, 938 East Sixtieth street, Los Angeles, has been issued a building permit for construction of an addition to its foundry to cover an area of 26 x 44 feet and to cost $1100.

* * *

Symington-Gould Corp., Rochester, N. Y., will erect added manufacturing facilities for the production of tank armor under allocation of $1,256,105 made by the Defense Plant Corp.

* * *

Furnace Foundry Co., Washington Court House, O., has been incorporated to build a foundry on site furnished by local businessmen at a cost of $20,000. Leo P. Fedigan is plant superintendent.

* * *

Fairbanks, Morse & Co., Chicago, has received authorization to build a $5,500,000 addition to its Beloit plant, for manufacture of diesel motors for the Navy. The new building, 460 x 660 will contain 300,000 square feet of floor space.

* * *

Pacific Car & Foundry Co., Seattle, Wash., has been allotted $700,000 by the Defense Plant Corp., for construction of an addition to the Renton plant so that it may produce castings up to 15 tons for use in local shipyards.

* * *

Plans for construction of a $14,000,000 armor plate plant at Granite City, Ill., have been announced. The new plant, to manufacture cast steel armor plate for tanks will be on a tract adjoining the Commonwealth Steel Co., Granite City, Ill.

* * *

Sargent & Greenleaf Inc., Rochester, N. Y., has completed a 40 x 60-foot concrete and steel addition to its foundry. New equipment has been purchased and installed. The foundry's working force will be increased 60 per cent. E. P. Meade is foundry manager.

* * *

Commerce Pattern Foundry & Machine Co., formerly located at 2211 Grand River avenue, Detroit, now occupies a building at 7450 Melville avenue, Detroit. The new plant, double the floor space of the former building is equipped for foundry, laboratory, pattern and machine shops. E. A. Rutt is general superintendent.

NEW EQUIPMENT and Supplies

Heat Treating

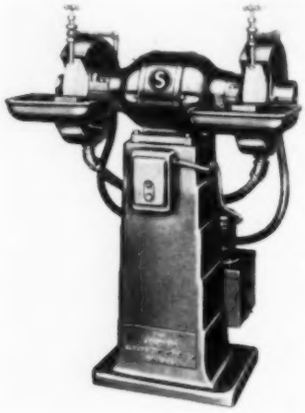
The accompanying illustration shows a new type furnace developed by the Despatch Oven Co., Minneapolis, for the heat treatment of aluminum alloy castings. The furnace also can be used for tempering and drawing of alloy steels, normalizing and stress relieving of castings and welded sections and many other heat treating processes requiring a temperature range up to 1200 degrees Fahr. Inside working dimensions of the furnace are 7 feet wide, 8 feet high and 15 feet in length. Overall dimensions are 10 feet wide, 9 feet high, not including the heater equipment, and 16 feet in length. Approximately 5000 to 7000 pounds of aluminum castings are placed on the car. Through a special gear rack system on the car it can be run into the furnace quickly after it is loaded.

Conveyor Idler

Link-Belt Co., Indianapolis, Ind., has developed a swiveling self aligning idler for automatically correcting misalignment of either carrying or return runs of nonreversing conveyor belts supported on flat roll idlers. The new idler has a centrally pivoted cross member which has a flat idler roll for supporting the belt and a vertically mounted actuating roll at each end for lightly contacting the edge of the belt when its lateral misalignment exceeds a predetermined amount. When used on return runs, one idler should be placed close to tail or take up shaft so that the belt will be guided centrally on the pulley, and one at every 10 or 15 idler spaces. On the carrying run, one idler should be placed just beyond the loading chute; and one at every 10 or 15 spaces thereafter. For flat roll belt conveyors that must operate in either direction, self aligning idlers of special design are available.

Wet Grinder

The Standard Electrical Tool Co., Cincinnati, O., recently has developed a line of 12 and 14-inch heavy duty wet grinders as shown in the accompanying illustration. The arrangement includes a wet grinding hood with integral splash bowl and adjustable work rest. Equipment on each guard includes a valve for controlling the flow of water, adjustable nozzle and piping. Bottom of the guard trough is fitted with hose connection for gravity return of water to the tank. A motor driven pump with tank is secured to the back of the pedestal and suitable piping carries the water to each guard. The pump has capacity of 10 gallons per minute. Grinder motor and pump motor are operated simultaneously through the push button safety starter at the front of the machine. The machine also is available as a combination wet and dry grinder. The safety hinge door guard for dry grinding can be had either on the right or left side.



Drill Press

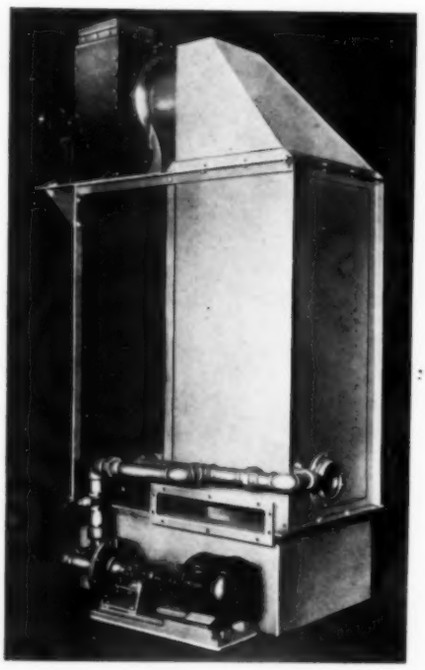
The Delta Mfg. Co., Milwaukee, has made available a new and improved type of low cost power feed drill press in which the unusual design of the power feed unit, operating directly off the bottom drive of the motor instead of off the spindle, makes possible a wide range of feeds, from 0.0010 to 0.016 inches per revolution of spindle in the slow speed drill presses to 0.0005 to 0.009 in the high speed machines. Two 4-step cone pulleys and a special belt tension release make feed speed changes quick and safe. The heart of the power feed is a bronze gear and specially hardened and ground steel worm that assure positive accurate stopping and long satisfactory service. Other features include: Quick traverse by hand from starting position to work; instant switching from power to hand feed and reverse without changing or removing parts; safety lock to prevent damage to drill press when power feed is disengaged; adjustable automatic stop and return. The new line includes single and multiple spindle 17-inch units, in slow and high speed models, with table or head raising mechanisms using either Delta or standard NEMA frame motors.

Steel Grating

Wm. F. Klemp Co., Chicago, is making a welded steel grating which is claimed to have many features including safety, rigidity, durability, self cleaning and easy sure foot travel. The new grating is constructed from hot rolled hexagonal steel bars placed at right angles on top of flat bearing bars set on edge and then electro welded under great pressure. The grating is made with the main bars on 1-3/16-inch centers, in panels 24 inches wide and in lengths up to 25 feet. Other spacings can be supplied. Odd lengths of panels are supplied to fill out necessary dimensions. A safe load table is furnished for bearing depths and thicknesses to meet requirements.

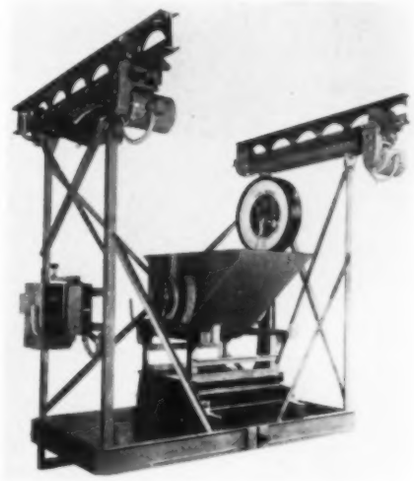
Dust Collector

Industrial Sheet Metal Works, Detroit, has developed a new hydrowhirl dust collector which removes hazards attending the processing of magnesium and its alloys. Dust created by buffing, polishing and grinding is effectively trapped and brought down into a tank where it becomes a sludge to be burned or buried in the ground. The new device works on an entirely new principle in wet dust collection. It is claimed to be effective on all types of metal dust. The working mechanism consists of a rotating shaft on which a number of disks are centered. The controlled rotating speed of the shaft in a horizontal plane throws a rain of water into the baffled section of the unit where the dust is whirled out of the air stream. Scientific calculations have determined a proper balance between the velocities of air and water. This balance insures thoroughly cleaned air which may be returned to the building.



Scale Car

Cleveland Tramrail division, the Cleveland Crane & Engineering Co., Wickliffe, O., recently has deveolped a traveling batch scale car, which it is claimed is particularly adapted to the handling of batch materials entering into the manufacture of rubber and clay products. It can be adapted to the handling of chemicals and batch materials used in a variety of industries. The car shown in the accompanying illustration is motor driven and controlled by an operator who rides on the platform on the left side of the bucket. A variable speed drum controller permits the car to be driven at any speed up to 300 feet per minute. Double overhead rails make it possible to straddle overhead bins so that their chutes may be brought close to the car bucket. The unit makes it possible to gather the exact amounts from various bins to make up the batch. The scale on the car accurately weighs the ingredients as they are dumped in. The bucket easily is emptied by tilting through use of a crank wheel. The unit illustrated will handle batch loads of 1000 pounds. Other traveling batch scales can be provided to meet individual requirements.



Grinders

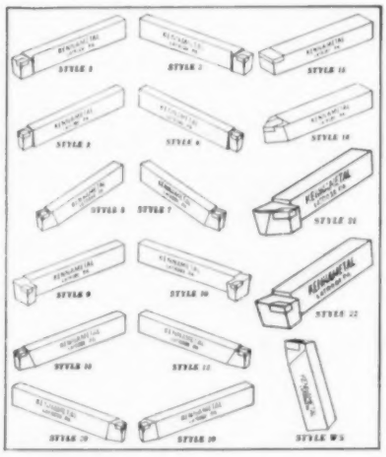
Hammond Machinery Builders, Inc., Kalamazoo, Mich., recently has placed on the market three new functionally streamlined grinders for tool and light snagging. Design of the new machines stresses over size construction of all moving parts. Base of the machine is heavy cast iron with straight vertical lines unbroken by protruding parts. A heavy duty motor on spindle for 10, 12 and 14-inch wheels is streamlined into the base at the top. This is supplied in 1, 2 or 3 horsepower, 220 or 440 volt, three phase, 60 cycle alternating current. All motors have a spindle speed of 1750 revolutions per minute. Standard equipment includes the heavy duty motor with over size ball bearings sealed against dust, push button starter with overload protection, heavy exhaust type semisteel guards, adjustable spark deflectors, tool tray and removable water pot, adjustable tool rests. All moving parts are closely machined and built to rigid machine tool specifications for smoothness and precision in operation. The grinders also are furnished as a combination grinder buffer, or with each end of the spindle extended to form a buffing and polishing lathe.

Pencil Compass

The V & E Engineering Co., 758 South Fair Oaks, Pasadena, Calif., announces a new type bow pencil compass with open truss design to reduce weight. All parts are steel with the exception of the dural center screw thumb piece and handle. The center screw articulates with the legs by cylindrical nuts. The legs bear upon a double grooved broad base hinge pin to insure strength and perfect alignment. The compass is 6 inches in length and will describe a maximum 10-inch circle. Replacement of pencil lead and shoulder point by two hard and tough steel points converts the instrument into an efficient divider suitable for pattern making, tool and die making, sheet metal layout, etc. It is stated the device has had a popular reception in schools, shops, and industrial drafting rooms, or other places where it is necessary to draw circles quickly and accurately on paper, wood or metal.

Carbide Tools

McKenna Metals Co., Latrobe, Pa., is distributing a weekly stock sheet listing quantities of various standard style carbide tools carried in stock. Tools carried in stock are



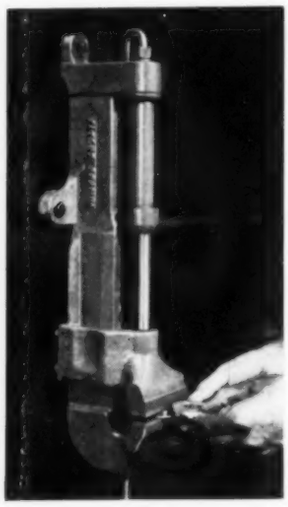
rough ground and tipped with the carbide metal most commonly used for cutting steel. Tools are shipped immediately upon receipt of order. Partial shipments are made on unusually large orders. The company also announces that the tools when not carried in stock, are made up and shipped within 48 hours. On modified standard tools, orders are filled within a week or 10 days.

Wheel Dresser

The Ideal Commutator Dresser Co., Sycamore, Ill., has developed a new abrasive wheel type grinding wheel dresser that is said to give a cutting and truing effect almost equal to that of a diamond. The cutting wheel is held in a protective metal housing which deflects the grindings away from the operator. A large handle makes it convenient to hold and use. When necessary the cutting wheel is replaceable. Other uses include the truing of cut up and uneven sides, dressing out deep grooves and out of roundness, restoring out of balance wheels. It also can be used to shape wheels into different forms. Over all length is 13¾ inches. Weight 3⅛ pounds.

Hydraulic Vise

The Studebaker Machine Co., Chicago, recently has developed a new hydraulic vise capable of developing pressure up to 5 tons between the jaws. It is claimed the new vise is designed to speed up small press and cutting operations as well as ordinary vise work. It is stated to have wide application on production lines, in tool rooms and for maintenance. The vise is operated entirely by foot control thus permitting the use of both hands in setting up and removing the work. No outside power is required. The unit is self sufficient. Pressure to close the jaws is controlled by a foot pedal pump arrangement in a pedestal mounted on the floor. It is connected with the vise proper by a steel tube which carries the hydraulic fluid to a ram behind the back jaw and thus moves it forward. The front jaw is stationary. Stepping on one pedal moves the vise jaw to contact against the work. A second pedal applies the pressure. A



third pedal releases the jaw. The vise may be mounted on a bench or vertically on wall or post, or on a portable stand. Special jaw faces are available. It may be mounted as a fixture on drilling machine, shaper, miller or grinder. Construction is all semisteel. The hydraulic pump is precision fitted to insure accurate operation and long life. The sliding jaw and base are machined accurately. Pump and ram cylinders are honed and polished.

Return Idler

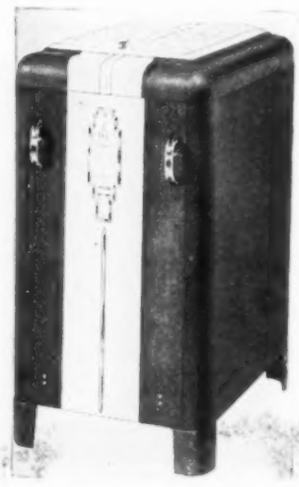
Link-Belt Co., Indianapolis, Ind., has developed a new line of rubber tread idlers for supporting the return run of belt conveyors 14 to 60 inches in width. Each complete idler consists of from 4 to 12, 6-inch diameter rubber tired rolls suitably spaced and mounted on a roller bearing equipped steel tube that will fit into the same supporting hangers as the regular return idler roll. Individual rolls consist of a renewable extruded rubber tire clamped between two steel disks firmly held together by three round head bolts. The rubber tire is split and readily can be removed and replaced with a new tire. The new idlers are specially recommended for conveyors handling corrosive, abrasive, wet or sticky materials. There is only a rubber to rubber contact between return idler and the under side of the conveyor belt. The kneading action of the rubber treads keeps the material from building up. Also helps to break and loosen ice in freezing weather.

Hand Cream

Mitts Mfg. Co., New York, is marketing a water soluble hand cream to be applied to the hands before starting work. It is claimed that the cream dries quickly and acts as an invisible glove guarding the hands from grease, paint, ink and other materials that are difficult to remove. It also protects the hands from many irritating substances which cause industrial skin trouble. It is said that the cream washes off easily with soap and water and takes all dirt with it.

Rectifier

Benwood Linze Co., St. Louis, has made an addition to its line of rectifiers and rectifier equipment. This new rectifier shown in the accompanying illustration is designed for electroplating. It is claimed they are extremely flexible and economical. It will serve individual tanks; or a number of units may be grouped in parallel to meet demands for heavy current loads; or the units may be grouped in series for maximum high voltage requirements. The rectifiers are assembled in cabinets as complete units, less controls. They are compact and mobile. Models are available for 300 ampere and 500 ampere capacity at 6 volts and 12 volts, operating from 230 volt and 440 volt, three phase, 60 cycle, alternating current service. Control units also are available which provide a variation in voltage from the maximum for the unit down to zero volts.



Air Controller

The Foxboro Co., Foxboro, Mass., has designed a new controller which does not depart from the original control principle, but in which the

new features are refinements for better appearance and still closer control. The new model appears in the new universal rectangular case, combining practical convenience with attractive appearanc. Panel mounted, the instrument extends only ¾-inch from the panel surface. The door is recessed, hinges and hasp are flush with the door surface. A dual pressure indicator, replacing the customary two small gages, easily is seen through a rectangular opening in the door. Interior illumination is provided where desired. All operating adjustments are made from the front of the case, the adjusting mechanisms for change of control point, throttling range, and reset resistance are immediately accessible when the door is opened. The entire operating mechanism is protected and concealed behind a removable plate. Unit construction simplifies replacement of the measurement system, changing the type of control or any other major servicing of the mechanism that ever may be necessary.

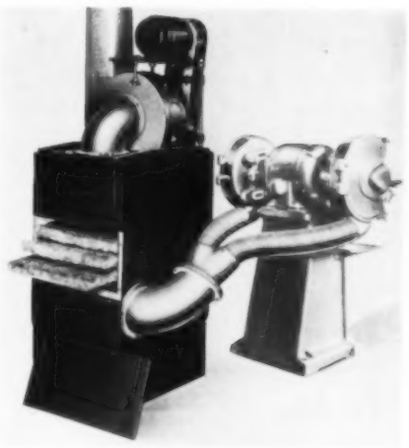
Smoke Mask

H. S. Cover, 98 Chippewa Street, South Bend, Ind., recently has introduced a new double sponge smoke mask with a soft rubber body and twin filter apertures, each containing a large fine texture sponge. The nose of the respirator is equipped with patented plastic valve that exhausts breathed air. Another feature

is the new slide fastener type head band that is easier to adjust and quickly can be fitted to any head size. The twin capacity of this new mask is claimed to give wearer greater breathing comfort. Moistened with water the sponges keep smoke out of the lungs. Unit is foldable to fit the pocket. The mask fits low on the face and does not interfere with goggles. Weight is less than 5 ounces.

Exhauster

The Hisey-Wolf Machine Co., Cincinnati, O., has designed a combination exhauster and filter in which the dust laden air enters a cyclone collector which removes the coarser particles. After passing through impingement type filters which remove the fine dust, it is claimed the air



is so clean it may be recirculated in the room after leaving the fan. A handy cleanout is provided for the heavy particles. The filters readily are removable for cleaning by shaking. The large fans and motors provide high static pressure, yet comparatively quiet operation.

Breaker Switch

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has designed a new low cost multi-breaker for use on any normal duty application that otherwise would require fuses or fused switches. The new unit shown in the accompanying illustration is available in two types. These 15 to 100 amperes, 2 and 3 pole breakers are for use on alternating circuits up to 230 volts. The steel enclosure is dust resisting with 10 concentric knock outs for conduit or cable connections. In operation, a bimetal thermal element is actuated by overload or short circuit and causes the breaker to trip. While the breaker trips immediately on short circuit or dangerous overload, an inverse time characteristic allows it to remain closed during temporary harmless overloads. An in-

dicating target on the enclosure cover shows when multi-breaker has tripped.

Transformer

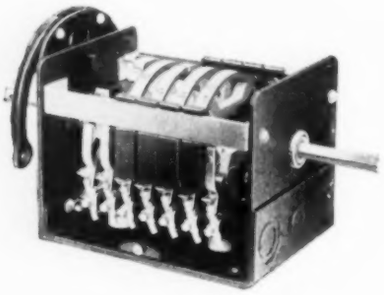
Ideal Commutator Dresser Co., Sycamore, Ill., has designed a new safety device for workmen using electrical extensions in damp, all metal or otherwise hazardous locations. A step down transformer easily is plugged in between the power supply and the extension to reduce the extension voltage to a harmless 6 volts. The transformer has a 10-foot three conductor safety type primary cord. Capacity is 50 watts with a 25-foot extension. Longer extensions require proportionately lower watt lamps. The device is available for 110 volt, 50 to 60 cycle or 25 cycle alternating current. Weight 4½ pounds for 60 cycle and 6¾ pounds for 25 cycle. Dimensions 2⅞ x 3⅞ x 4 inches.

Sweat Band

American Optical Co., Southbridge, Mass., is marketing a new light weight absorbent sweat band in which the sponge is 7½ inches long, can be sterilized and used repeatedly. It is claimed that the new sweat band keeps the sweat out of the eyes and off the goggles thereby keeping the vision clear.

Drum Controllers

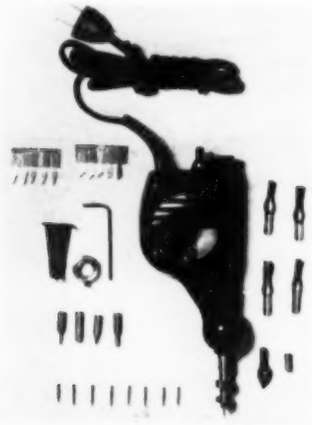
Cutler-Hammer Inc., Milwaukee, is manufacturing a new line of drum controllers for small cranes and hoists. Small and compact in size it is claimed the new drums have several features of outstanding interest. A rope operating lever, embodying a new equalized torque prin-



ciple is claimed to eliminate cumbersome sheave wheel, rope guard and external return spring and provides smooth, easy operation even when the rope is pulled at an angle. A new anti-plug feature increases drum life by making it impossible to whip drum from full forward to full reverse position. Drum can be reversed quickly, but yet a definite time delay is required in the off position. These new drums are available in self centering rope lever, self centering and non-self centering radial lever types for four or six speeds.

Handy Tool

Burgess Handicraft Supplies, Chicago, has made available a new versatile tool operating on the vibrating principle. It is claimed the new tool shown in the accompanying illustration makes 7200 strokes per minute, with stroke adjustable up to $\frac{1}{8}$-inch. The uniquely designed chuck easily grips a large variety of engraving needles, cutting knives, gages and hammers. Special fittings, depth gages, etc., make it more wide-



ly usable for either craft work or production. The tool can be used for engraving, cutting, hammering or carving metal, wood, linoleum, sheet rubber, sheet cork, glass, ceramics and most other materials. The tool is designed for continuous operation and is said to remain cool when operated continuously in production. A comfortable ball grip permits ease in handling and accurate control by the operator. It can be used with jigs or fixtures to cut or engrave to a template. Accessories include fine and coarse needles for engraving, tungsten tipped needles for cutting or engraving glass and ceramic materials, knife blades, hammer tips, special cutters and a foot gage for controlling the depth of cut.

Protective Apron

American Optical Co., Southbridge, Mass., recently has placed on the market a new protective apron shown in the accompanying

illustration. Material of which the apron is composed is said to provide protection against oils, acids and greases. It resists heat and will not burn. Material is tough and light in weight and is said to assure both comfort and durability. The apron is made in two styles and 11 sizes.

Fingerless Glove

Industrial Gloves Co., Danville, Ill., recently has developed a fingerless glove to meet the unusual requirements of operators who must have complete freedom of the fingers; who need the sense of touch to sort or pick up thin sheets or small parts. It is claimed that complete protection is provided for the palm and between thumb and fore finger. The glove is made of chrome-tanned long wearing split leather. Steel stitching eliminates the pos-

sibility of ripping. The glove may be worn over the bare hand or pulled over a light weight glove. It is made in three sizes, small for women operators, medium and large for men.

Grease Pencil

Joseph Dixon Crucible Co., Jersey City, N. J., recently has added the colors purple and green to its line of grease pencils; bringing the range of colors to 10. The pencils can be used for marking highly polished metals, glass and other glazed surfaces. They are designed to leave a clear, durable mark on polished surfaces without danger of scratching or scoring. The pencils can be used to mark metal parts for future identification or where instructions to workers or inspectors must be written on the part. In layout work directly on the metal, the markings will not wash off when the metal is sprayed.

Floodlight

Wabash Appliance Co., Brooklyn, N. Y., has developed a new-type concentrating floodlight bulb designed for high-bay lighting in industrial plants, etc. The bulb is said to deliver a concentrated flood of light that cuts through distance, haze and smoke to provide brilliant illumination even in foundries and factories where high ceilings and traveling cranes and other obstructions make impractical the installation of lights closer to the work plane. The filament is mounted at the exact focal point of the hump-shape parabola

of the bulb so that the light rays are forced straight out of the bulb without waste. Inside of the bulb is lined with pure polished silver to form a permanently brilliant reflector that cannot be dimmed by dirt, fumes or smoke.

Respirator

DeVilbiss Co., Toledo, O., has designed a new respirator which is claimed to afford maximum protection against the inhalation of dusts. It contains a compact cartridge measuring 1½ x 2⅞ inches, weighing only 1 ounce which provides more than 41 square inches of breathing and filtering area. A multivane construction permits the area of the filter to be used efficiently. The filter is cleaned easily by blowing accumulated dust from the vanes with an air dusting gun or nozzle. The respirator is designed to fit the contour of practically any face closely and without leakage.

Magnifier

George Scherr Co., New York, has placed on the market a new illuminated magnifier which plugs into the standard 110-volt circuit. It is said to have an unusually wide magnification field and to offer scientifically correct lighting directly on the object in the field, shutting off reflections. The magnifier was developed particularly for use in defense industries to detect quickly troublesome and costly sources of delay and waste. It may be used for examination of castings, tools and dies, setting of tools, reading blue prints, graduations on dials, etc. The magnifier also may be used by physicians and dentists and in laboratories. The device is attached to a sturdy stand with a universal angle clamp so that it may be turned to any angle and raised and lowered. It may be removed from the stand when desired.

Bearing Metal

A new babbitt metal for bearings subject to high pressures and temperatures has been developed by Magnolia Metal Co., Elizabeth, N. J. The metal contains nickel and has a tensile strength of 17,500 pounds per square inch; a yield point of 6500 pounds per square inch; brinell hardness of 27 and pouring temperature ranges from 950 to 1000 degrees Fahr. It is claimed that the high softening and pouring temperatures make the metal resistant to extreme local heat, and its high strength adapts it to service under heavy bearing loads.

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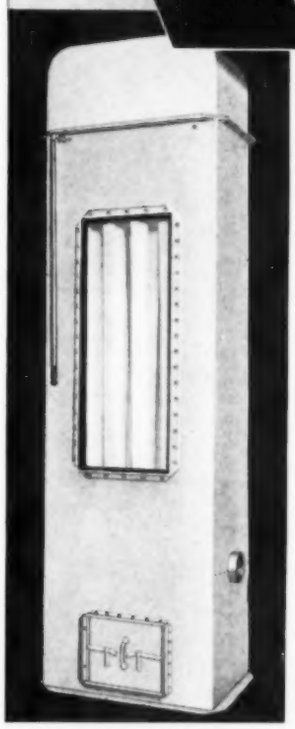
270 to 100,000 - or more!



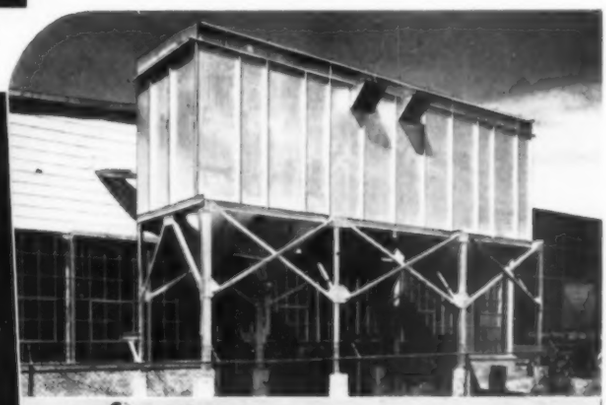
Above: Assembled type "Dustube" Dust Collector with hand shaker.

WHETHER your dust problem is very small or extremely large there is an American "Dustube" cloth bag type dust collector built to handle it—no matter what C. F. M. you may require.

We would like to show you how the "Dustube" packs more operating and cost-saving advantages than any other collector employing the cloth filter principle. How it is the simplest to install, operate, inspect, and maintain. How it provides the highest efficiencies by actual test. Obligations? None whatever—write us today, won't you, for "Dustube" catalog No. 22.

Above: Assembled type "Dustube" Dust Collector.

Right: Knocked-Down Type "Dustube" Dust Collector.



TRADE MARK

THE AMERICAN MOLDER

AMERICAN FOUNDRY EQUIPMENT CO.

505 S. BYRKIT ST.

MISHAWAKA, IND.

STUDY BUSINESS PROBLEMS

(*Continued from page* 65)

develops, the problem of sustained unemployment will depend on adjustment of costs among other things; how this is done will depend on the extent of unemployment.

Clare E. Hoffman, member of Congress from Michigan, reviewed numerous cases in which he criticized higher court decisions involving labor laws, saying an amendment redefining what is a labor dispute between employer and employe is badly needed; also just and adequate enforcement laws now on statute books.

Distribution of materials, equipment and supplies by allocation, taking into consideration the volume available with more definite information as to consumer inventories, will probably be more satisfactory than the varied and confused priority system, according to E. L. Shaner, editor-in-chief, *Steel* and president, Penton Publishing Co. As emphasis is shifted more and more toward allocations and less on priority ratings, some confusion may be expected, but improvement in the flow of materials is also likely. If the available supply is not too limited, priorities work well, said Mr. Shaner, but too many preference ratings issued in relation to supply results in confusion and industry has been experiencing that condition.

Allocation, which starts at the top, with due consideration of the amount of material available should bring better results, but even with allocation, or combination of allocation and priorities, operating at the highest possible degree of efficiency, there will still be grief, according to Mr. Shaner; one reason will be the unco-ordinated efforts of too many government agencies and the need of one directing head for defense production.

Until a spirit of unity is generated among the people, the utmost in potential benefits from material resources, will not be attained, regardless of how perfectly industrial resources are developed or how efficient the organization for mobilizing them for defense. A revival of the American spirit of 1918 is needed, declared Mr. Shaner, with renewed confidence in the merit of American institutions and an almost fanatical zeal to preserve the great advantages of freedom the nation inherited. With revival of that spirit many problems which now plague industrialists will vanish before the united will of a people determined to win for principles they understand.

Grand Scale Planning

"To play safe our government is planning on a grand scale. It is trying to schedule our industrial operations so that they, in conjunction with the contributions of England, Canada and other free countries, will do in three years what Hitler has been doing in seven years. This calls for a sharp increase in the tempo of our defense program. It is estimated that today only about 15 per cent of our national resources is devoted to defense. We are told that this percentage must be upped to more than 30 per cent by the end of 1942 and that we may have to exceed 50 per cent at the peak of our effort."

Developments in cast metals were reviewed by C. H. Lorig, supervising metallurgist, Battelle Institute, Columbus, O. There has been a definite improvement in pig iron in recent years by the introduction of the small pig, a closer silicon content classification and a greater uniformity in analysis of each carload lot. According to Mr. Lorig, some furnace operators are giving serious thought to production of low carbon pig iron for the foundry trade.

Improved cupola equipment allow-

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JOLT SQUEEZE

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The new HAYNES Jolt Squeeze Molding Machine, designed and built by a practical foundryman, embodies new features—the rigid one piece frame insures accuracy of all working parts and a minimum of necessary repair—the squeeze head will swing either to right or left by a simple adjustment. This molding machine is simple, fast and accurate, uses a minimum of air and is built to stand today's hard usage.

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ing for more efficient melting has been an outstanding factor in gray iron foundry practice. Beside effecting definite improvements in iron qualities, controlled combustion is promoting fuel economy. While there are few cupolas now equipped for humidity control, Mr. Lorig declared increasingly wider use in cupola operation, notably where heavy tonnages of iron are melted, could be expected.

Hot blast cupolas are being installed in some of the larger foundries to reduce the amount of coke per charge, to obtain hotter iron, lower costs of melting and to increase the melting rate. More attention is also being given to the control of all properties of molding sands. Zircon sand cores have been remarkably successful when used in heavy metal sections where burning-in creates a problem in cleaning.

Metal Is Improved

"The outstanding developments during recent years in gray iron have been in the metal itself," said Dr. Lorig. "Through the control of carbon and silicon contents and of structure, unalloyed irons are now being made consistently, in some foundries, with tensile strengths well over 40,000 lb. per sq. in. Influence of carbon predominates over all other constituents. The gray iron industry also has available certain control practices, which improve the quality of the iron by providing a better graphite arrangement, to give higher and more consistent physical properties and better resistance to growth, wear and galling."

The introduction of alloying elements in cast iron has had a profound effect on the gray iron industry as a whole. It has helped to make the industry high-strength conscious, and led to a sound growth in the manufacture and the use of irons whose strengths far exceed what previously was the rule.

A few foundries are producing short-cycle malleable, through the accelerating effect of higher silicon contents and higher annealing temperatures. This calls for very careful supervision of the melting operation, a close raw materials check, and good annealing furnaces and practice. Some short cycle malleable irons are fully malleablized in less than 15 hours as compared with regular annealing cycles of 75 to 125 hours. Various so-called pearlitic malleable irons are available, but they are being produced on a relatively small scale as yet, Dr. Lorig said.

A recent innovation is the continuous casting of steel as practiced at the Ford plant. This is being done by utilizing electric holding furnaces for the metal and conveyor reels for bringing the molds direct to the pouring spouts. This

GET SPEED!
.. AND SAVE MONEY, TOO

Installed at strategic points in your production system—Standard Conveyors often prove to be practically the only equipment needed to accelerate the pace of production. Saving valuable time—using plant space more effectively—Standard Conveyor engineers have worked out problems like these for many manufacturers. Here is a representative example: in a large armament plant where Standard Conveyors are used for fast, safe "line" production of 3 inch A. A. shell:

We selected your type of roller conveyor for all of our conveying operations because we felt that the contour of your steel roller is very favorable to the transportation of shells which have a finish turned copper band on them. The concave roller gives the band a two-point contact, and consequently reduces the liability of damage by 50% over what it would be if the rollers were straight or just slightly concave.

Get Conveyor Engineering That Shows Results

Because of operating benefits like those cited above, Standard Conveyors inevitably result in stepped-up production, plus a substantial bonus of cost savings in material handling. To be certain of conveyor engineering that will show results, call in a Standard Conveyor engineer—check with him to see how Standard Conveyors can earn and save in your plant.

Send for 76-page Standard Booklet

Interesting and informative, this booklet, (F-12) "Conveyors by Standard," will prove a valuable reference book on conveyors and conveying methods to every production executive and others concerned with fast, low-cost material handling.

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FIRST FOR FASTER PRODUCTION
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system not only saves time but also produces more uniform castings because the metal for each casting is delivered at uniform temperature and is of uniform composition.

The foreman's role in management was discussed by H. O. Menck, works manager, Harnischfeger Corp., Milwaukee, in which he strongly urged a closer co-operation between management and foreman, notably in the furthering of successful labor relations policies.

The Association voted a resolution urging congressional laws guaranteeing the right to work on the part of American labor without coercion, and opposing the closed shop or check-off system; favoring such enactments not only in federal but state statutes.

All officers were re-elected with W. D. Hamerstadt, Rockwood Mfg. Co., Indianapolis, again heading the organization. D. C. Bakewell, Blaw-Knox Co., Pittsburgh, will continue as vice president; A. E. McClintock, Chicago, as commissioner, and J. M. Taylor, Chicago, as secretary-treasurer. Various district committees named for the ensuing year include the following:

First District, the New England states: H. B. Johnson Jr., General Fire Extinguisher Co., Providence, R. I.; Franklin Farrel III, Farrel-Birmingham Co., Ansonia, Conn.; A. M. Cottrell Jr., C. B. Cottrell & Sons Co., Westerly, R. I.; W. W. C. Ball, Taylor & Fenn Co., Hartford, Conn.; Howard A. Stockwell, Barbour-Stockwell Co., Cambridge, Mass.

Second district, New York and that part of New Jersey north of a line drawn from Lambertville to Point Pleasant, and the provinces of Ontario and Quebec in the Dominion of Canada: P. R. Van Duyne, Meeker Foundry Co., Newark, N. J.; Hamilton Garnsey Jr., Goulds Pumps Inc., Seneca Falls, N. Y.; C. P. Clark Clark Bros. Co., Olean, N. Y.; J. H. Hornung, Otis Elevator Co., Yonkers, N. Y.; C. W. Pearson, Buffalo Foundry & Machine Co., Buffalo.

Third district, Pennsylvania, Delaware, Maryland, District of Columbia, and that part of New Jersey south of a line drawn from Lambertville to Point Pleasant and including these two towns: G. L. Coppage, Pusey & Jones Corp., Wilmington, Del.; George R. Casey, Treadwell Engineering Co., Easton, Pa.; D. J. Peake, Florence Pipe Foundry & Machine Co., Florence, N. J.; Edward C. Moore, Erie City Iron Works, Erie, Pa.; James S. Ervin, Mackintosh-Hemphill Co., Pittsburgh.

Fourth district, the lower peninsula of Michigan, Ohio, Kentucky, Indiana and West Virginia: George W. Cannon, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.; R. W. Gillespie, Jeffrey Mfg. Co., Columbus, O.; I. R. Wagner, Electric Steel Castings Co., Indianapolis; John M. Price, Ferro Machine & Foundry Co., Cleveland; Eugene A. Leary, Cincinnati Steel Castings Co., Cincinnati.

Fifth district, Illinois, Missouri, Oklahoma, Kansas, Nebraska, Iowa: C. B. Magrath, Greenlee Foundry Co., Chicago; E. L. Berry, Link-Belt Co., Chicago; J. F. Culver, Century Electric Co., St. Louis; Ira G. Whitney, A. Y. McDonald Mfg. Co., Dubuque, Iowa; A. H. Head, John Deere Tractor Co., Waterloo, Iowa.

Sixth district, Wisconsin, Minnesota, upper peninsula of Michigan, North Dakota and the province of Manitoba in Canada: William J. Grede, Spring City Foundry division, Grede Foundries Inc.; Waukesha, Wis.; F. H. Clausen, Van Brunt Mfg. Co., Horicon, Wis.; H. O. Menck, Harnischfeger Corp., Milwaukee; L. S. Peregoy, Sivyer Steel Castings Co., Milwaukee; George E. Long, Koehring Co., Milwaukee.

Seventh district, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Texas and Tennessee: Foskett Brown, Gray & Dudley Co., Nashville, Tenn.; John D. Capron, Glamorgan Pipe & Foundry Co., Lynchburg, Va.; W. C. Trout, Lufkin Foundry & Machine Co., Lufkin, Tex.; Warren Whitney, James B. Clow & Sons, Birmingham, Ala.; Frank M. Robbins, Ross-Meehan Foundries, Chattanooga, Tenn.

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Unrestricted Metal Flow . . Easy to

Handle . . Less Outline Remains

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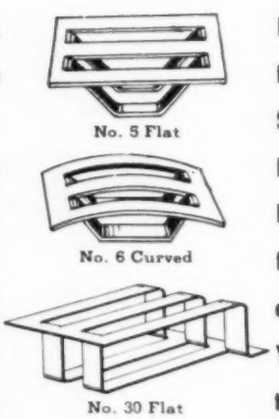

Both customers and foundrymen too like SCHMITZ CHAPLETS because they leave little or no disfiguring outlines on casting surfaces. You will like them too! Get Bulletin 1023

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Publishes Booklet

Air Reduction Co. Inc., New York, recently published a 58-page booklet entitled, "Air Reduction—A Quarter Century of Progress" which gives a brief history of the firm and its five associated companies. The booklet is well illustrated, and designed to give a quick over-all picture of the products produced with their applications.

Laclede-Christy Clay Products Co., St. Louis, is increasing its productive facilities by construction of two new tunnel kilns, installation of modern presses, dryers, etc., to cost approximately $1,000,000.

CAST STEEL BOMBS

(*Continued from page* 53)

minor and inconsequential details. Canada, he pointed out is an immense country, 3000 miles or more from the Atlantic to the Pacific and no one knows definitely how many miles from the international boundary line away to hellangone beyond Hudson Bay and into the Arctic regions.

Bound to be dozens of suitable sites. Through his standing and connections he could arrange about financing and building a plant. Experience proved that a new plant would attract a crew almost any place. A small number of imported supervisors and skilled workmen rapidly could train raw recruits.

They selected a suitable site near a town and a railroad in an out-of-the-way area covered with small spruce trees and blueberry bushes. Then they pulled off their coats figuratively speaking and by crowding 25 or 26 hours into each day they had the first promised sample lot of 500 castings ready by the time navigation opened in the spring.

Make Preliminary Plans

Preliminary plans were made in August when the warm sun shines all day and the brilliant harvest moon travels the familiar great arc in the sky, the arc it has traveled since the world began. Reference to the navigation feature, of course, was from an unconscious influence inherited from the days when everything from the long rifle, powder horn and bag of bullets, to general freight was transported over lake and river in the bateaux and birch bark canoe of the courier du bois, the men of the woods, the fur traders, the forest runners.

To anticipate the question which naturally rises in the reader's mind, the first sample batch of 500 shells was shipped the first week in April.

This does not represent a single day's output. Recruiting and training a crew takes time. Progress was steady from the beginning. Production advanced from day to day. For some time past the output has been maintained at the anticipated maximum. By enlargement of the plant and installation of further equipment, the output may be increased to any reasonable extent. Planned and built primarily for the production of steel shells, the plant through some slight changes readily may be adapted to the production of other castings when the need

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Wherever dust is produced they quickly, efficiently and economically collect it at its source—protecting your products, your equipment and your working conditions.

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for the missiles of destruction no longer exists.

In the future blessed and peaceful days when precautionary measures in connection with defense of the realm no longer are in force, when names and places may be mentioned openly and without restraint, proper recognition will be accorded the man with the financial and commercial knowledge, the courage to build a new plant, also his right hand man the ingenious and skillful foundryman who planned and built a plant, poured concrete and erected steel in a bitter Canadian winter when the temperature ranged as low as 32 degrees below zero, who ordered materials, supplies and equipment and then figuratively burned up the mail routes, the telegraph and telephone long distance lines with messages designed to expedite delivery.

In the face of common practice, ordinary observation, advice of experts and other sources of information he decided to mold and cast the shells in a vertical instead of a horizontal position; to dry the molds; to blow the cores; to utilize mechanical equipment to maximum degree and to subdivide the work to such an extent that ordinary intelligent men recruited in the locality could operate efficiently.

The program was based on constant movement of molds, cores and castings in the general direction of the final inspection and shipping dock. The only temporary delay in the forward movement is where a group of molds is assembled on a roller conveyor between heats from two electric furnaces. The conveyor has accommodation for 28 molds. The furnaces are arranged to tap in turn after each other and to deliver approximately 10,500 pounds of steel, enough to pour seven molds, or 28 shells at each heat. After the molds are poured they are moved forward to make room for others in a constant cycle.

Full co-operation by the various equipment manufacturers in the planning, construction, and installation of the main and minor features was an important factor in placing the plant in operation in record time. In the majority of instances standard pieces of equipment fitted readily into the general layout. In other instances special gadgets and ingenious devices were developed, introduced and incorporated. More detailed reference to some of the units will be covered in the second section of this presentation scheduled for an early future issue of THE FOUNDRY.

Melted in Electric Furnaces

Approximately one-half of the long building is devoted to cleaning, machining, testing, storing and shipping the shell castings. The foundry proper divided longitudinally by a row of steel columns into two main bays occupies the remainder of the building with the shakeout and sand preparation plant at one end and the electric furnaces at the other end. The two furnaces are arranged in tandem with relation to the length of the building. Space is reserved for a third furnace in the event that additional melting capacity becomes necessary. The two basic electric furnaces made by the Volta Furnace Co., Welland, Ont., are served by a traveling crane mounted on a runway inside the building and extending over an immense pile of scrap in the yard outside the east end of the building. High swing doors in the end wall permit passage of the crane. Each furnace has a normal melting rating of 5 tons, but as with practically all steel foundries the capacity frequently is exceeded. Heats of 6 or 7 tons are not uncommon. Steel for the shell castings conforms to the following approximate analysis: Carbon 0.25 per cent, silicon 0.40 per cent, manganese 0.70 per cent, sulphur 0.05 per cent, phosphorus 0.05 per cent.

Slight variation in the analysis is not regarded as a vitally important

Standardized Ingot Specifications

How Many Specifications Do You Require?

Consider the infinite variety of nonferrous parts required as America turns out everything from automobiles to battleships.

Then consider this: Identified with the growth of U. S. industry since 1880, Ajax has produced ingot and alloys to specifications covering, in the aggregate, virtually the entire range of nonferrous casting application or usefulness today.

Thus your requirements are met invariably with knowledge, with a solid grasp of procedures which begin *after* we deliver—as well as before. This applies to all your specifications—including NFIMI, ASTM, SAE, Federal, Naval, and the others.

The result is ingot metal and practical technical follow-through in which, *as always with Ajax*, you have implicit confidence.

Investigate These Alloys

15 STANDARD ALLOYS BY AJAX

Ajax Tombasil
Ajax Plastic Bronze
Ajax Anti-Acid Bronze
Ajax Phosphor Bronze
Ajax Red Brass Ingots
Ajax Manganese Bronze
Ajax High-Tensile Manganese Bronze
Ajax Golden Glow Yellow Brass
Ajax Nickel-Copper 50-50%
Ajax Manganese Copper
Ajax Aluminum Alloys
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
Ajax Phosphor Tin

NOTE

The first program for scientific control of ingot metal production was set up in and by the Ajax Metal Company 44 years ago.

THE AJAX METAL COMPANY
ESTABLISHED 1880 PHILADELPHIA

ASSOCIATE COMPANIES: AJAX ELECTRIC FURNACE CORPORATION, *Ajax-Wyatt Induction Furnaces for Melting*
AJAX ELECTROTHERMIC CORPORATION, *Ajax-Northrup Induction Furnaces for Melting, Heating*
AJAX ELECTRIC COMPANY, INC., *Electric Salt Bath Furnaces*

factor. Closest attention is concentrated on surface appearance, accuracy in shape, size and weight, and above all absolute concentricity and uniform thickness of the shell wall. Inspectors clothed with full authority and working under specifications that recognize nothing short of absolute perfection, examine and test each shell at every stage of progress from the shakeout to the shipping dock. From a foundry view point the castings are plain and simple. Ultimately they are destined to explode in a shower of scrap and yet the well known camel stands a better chance of passing through the needle's eye, than does a shell casting which fails to conform in every major and minor detail with a set of rigid specifications and microscopic tolerances.

Operating under these exacting conditions it is claimed the total number of rejects is less than 2 per cent.

General floor layout showing the location of the main equipment units and the path followed by the molds and cores may be noted in Fig. 7, a free hand sketch not drawn to scale. Commencing at the upper right, the sand for molds and cores is prepared in two of the latest type units made by the National Engineering Co., Chicago, equipped with automatic control and measuring devices. Further detail of this interesting installation, method of operation, sand mixtures, etc., will be presented in the second section of this description dealing with a steel foundry engaged exclusively in the manufacture of the bodies for aerial bombs.

Cope and drag molds are made on a pair of rollover, pattern draw jarring type molding machines supplied by the Herman Pneumatic Machine Co., Pittsburgh. Four patterns are mounted vertically on each pattern table, one set for the cope and one set for the drag. In foundry parlance the parting line on the patterns is approximately in the center, or an equal distance from each end. With this arrangement cope and drag flasks are the same depth. The flasks are cast steel, flanged and ribbed on the outside, provided with lifting trunnions and pierced with numerous vent holes for the rapid escape of steam and gas. Four ring formations in the bars in the drag fit closely on the core prints and serve as a solid bearing for the cores. Metal enters the mold through a single sprue in the center of the cope, terminating in a well at the bottom in the drag half of the mold and feeding into a gate in the form of a cross with a branch leading to each shell unit in the mold. A single modest size riser on top of the pointed end of the shell serves as a feeder. With this economical arrangement it is claimed the casting yield is approximately 80 per cent of the metal charged in the furnace.

The half molds are taken from the machines and placed on a slow moving conveyor which carries them through a long oven designed and built by the Foundry Equipment Co., Cleveland. At the opposite end of the oven the molds are removed, cored, closed and placed on a long double power driven roller conveyor. This conveyor slightly above floor level is in the adjoining bay and moves in a direction opposite to the former travel of the molds in the first bay. After the molds are filled with metal they continue to move forward until they arrive at the shakeout station equipped with a vibrating screen and jolting equipment made by the Simplicity Engineering Co., Durand, Mich. and with dust removal equipment made by the American Air Filter Co., Louisville, Ky. A short auxiliary conveyor running at right angles to the first, takes the empty flasks back to the vicinity of the molding machines. With cores, heads and gates removed the castings are given a full annealing treatment in a double car type oven,

Bradley Washfountain Installation

In Modern Sanitary Washrooms You'll Find Bradley Washfountains

Adequate sanitary facilities for washing are essential today—to reduce possible infection and to save time.

Bradley Washfountains provide ample facilities,—each serving 8 to 10 persons simultaneously with running water from a central sprayhead. The bowl is self-flushing to prevent collection of water and contamination. And it is set low so that it is easy to wash hands and arms—in fact you can wash to the waist.

Bradley Washfountains have been the first choice in industrial plants for many years—installed in practically all new plants and in existing buildings when modernizing and enlarging washroom facilities. They reduce water consumption, save space and time,—and provide the maximum in sanitation.

Our Washroom "Plan Book" with washroom floor plan suggestions will be sent you on request . . . BRADLEY WASHFOUNTAIN CO., 2217 W. Michigan St., Milwaukee, Wis.

BRADLEY washfountains

also built by the Foundry Equipment Co., but not shown in the sketch.

Cores for the castings are made as complete units on a core blowing machine specially designed by the Osborn Mfg. Co., Cleveland and dried in a vertical type oven designed and built by the Foundry Equipment Co., Cleveland and equipped with practically every modern device for drying cores economically, rapidly and according to scientific principles. In a shop presenting so many interesting features, probably the equipment and method of making the cores is the most spectacular.

This is the first of two articles dealing with the construction and operation of a shell casting steel foundry in Canada. Location and some other features are not available for publication. Subject matter and illustrations are presented through courtesy of the Department of Munitions and Supply, Ottawa, Canada. The second article will appear in an early future issue of THE FOUNDRY. The Editors

---

Office of the Foxboro Co. in St. Louis has been moved to the Continental building, 3615 Olive street, St. Louis.

Castings on the move

Whisk them through the Foundry;
Zip them through the Cleaning Room.

Use the following to shorten long jobs and eliminate unnecessary ones.

LION BINDER - A strong, fast drying paste; tie wires not needed. A strong binder that bakes very fast.

EASY CLEANER CORE COMPOUND - Makes cores that clean out of the castings readily.

VULCAN BLACKING - Can be adapted to swift application; gives good surface, cleans speedily.

DUST-ON FACING - Shake it on green sand molds, close and pour. No tooling. Fast cleaning.

SUPERIOR PLUMBAGO - Rubs in immediately; doesn't "lift" the sand - - peels beautifully.

SILKOTE - Paint or spray on steel foundry cores, dry sand molds and skin dried work. Adaptable to fast application. Casting surfaces are really clean.

Manufactured only by

J. S. McCORMICK CO.
PITTSBURGH, PA.
FOUNDRY FACINGS • SUPPLIES • EQUIPMENT

Consider Problems Of Industry

(*Concluded from page 57*)

Equipment and Supplies Unit, Office of Production Management, Washington, discussed various phases of the present defense problem at the luncheon meeting.

Officers elected were: President, A. C. Denison, president, Fulton Foundry & Machine Co., Cleveland; vice president, R. D. Phelps, president, Francis & Nygren Foundry Co., Chicago; secretary, George Walton, vice president, Madison Foundry Co., Cleveland, and treasurer, S. C. Mefford, treasurer, Auburn Foundry Inc., Auburn, Ind.

The following were elected to fill the vacancies on the board: R. O. Collins, R. O. Collins Iron Works, Tallahassee, Fla.; J. D. Crain, Vulcan Foundry Co., Oakland, Calif.; George Walton, Madison Foundry Co., Cleveland; Franklin Farrel, III, Farrel-Birmingham Co., Ansonia, Conn.; A. B. Root Jr., Hunt-Spiller Mfg. Corp., Boston. R. J. Redmond Buckeye Foundry Co., was re-elected. The resignation of John H. Pohlman, Pohlman Foundry Co., Buffalo,, N. Y. was accepted with regret and M. A. Fisher, president, Standard Buffalo Foundry Inc., Buffalo, was elected by the board to finish his unexpired term.

New Appeal Form For Copper

A special appeal form has been provided for manufacturers whose operations come under the special hardship clause of Copper Conservation Order M-9-c.

The new form, PD-167, may be obtained from any Priorities Division field office or by writing to the Priorities Division in Washington. Any appeal made must be filed on this form and must be mailed to the Director of Priorities, Reference M-9-c, Washington.

Most of the hardships arising under the order are unavoidable and are made necessary because of the serious copper shortage and the fact that available copper must be used for defense purposes.

In considering appeals, the Priorities Division will take account of such factors as sudden and harmful dislocations of employment and freezing of inventories which are in process.

In announcing the new form, Mr. Nelson emphasized: 1—No appeal will be considered unless it is made on the form provided; 2—the form should be used only in cases of especially serious hardship.

CASTINGS REPLACE FORGINGS

(*Continued from page* 56)

num industry suggests that before long there will be so much aluminum available that it may go begging and at a price per unit of volume that will give present replacements some close competition. This means that it will be necessary for foundrymen to be just one jump ahead of their competitors and continue to produce a superior product which will keep them in the lead at all times.

Graphitic steel has many desirable properties which makes it outstanding in the ferrous field. In general, the *machinability* is from 10 to 30 per cent better than steel forgings at the same brinell hardness. The excellent *damping* characteristics are exhibited in the many parts, such as the camshaft. It has a *high yield ratio*, especially when a brinell hardness of 200 or over is desirable.

Many installations have eliminated the bronze bushing, and the excellent non-seizing properties in metal to metal wear are recognized. That is illustrated in the elimination of the bronze bushing in the automotive rocker arm, operating on a hardened shaft. Crankshaft tests have proven the *high fatigue life* of ArmaSteel. One of its most valuable properties is that the metal responds readily to *localized hardening*.

Castings Are Flame Hardened

That property is used in flame hardening and induction hardening of the cams on camshafts, shifter yokes, gears; also the dipping of rocker arm pads in molten lead, followed by quenching. This surface hardness produces maximum wear resistance. *High hardenability rating* is a valuable property when the material is used to produce important gear parts. It has been found comparable to SAE 5040-A steel, using the Jominy hardenability test bar.

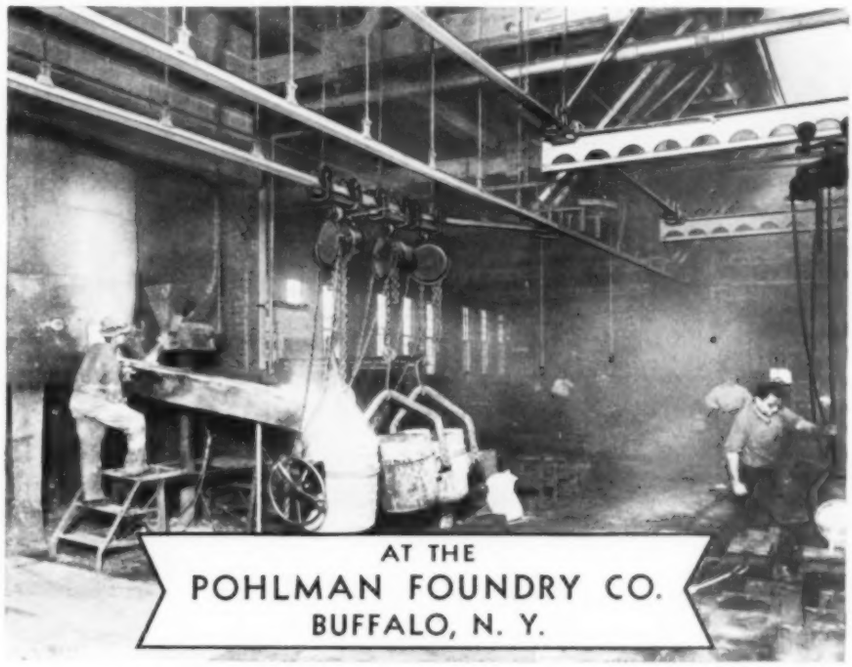
One of the greatest advantages in favor of castings, is the possibility of placing metal exactly where it will do the most good. That eliminates considerable machining. The reduction of machining operations severs one major bottleneck in many plants. Machine chips are the most costly things to produce, and the most useless.

One great contribution to the defense program which the casting industry can make is the time saved in the machining of castings versus forgings. Up to 50 per cent in man hours per part is being saved in many graphitic steel castings versus forgings. This is possible by producing castings to closer tolerances than forgings, thereby machining less excess metal.

A considerable saving in tool life is effected in the machining of the castings due to less metal removed and an easier machinable metal. Graphitic steel castings give these advantages:

1. Uniform structure of greater strength, shock and stress resistance. 2. Metal distributed where it will do the most good, maximum strength with minimum weight. 3. Widest range of physical properties. 4. Resistance to shock at sub-zero temperatures. 5. Responds to localized hardening, with high hardenability rating, maximum wear resistance. 6. Good machining qualities, mirror finish, low finishing costs, better streamlined appearance. 7. High rigidity, minimum deflection, accurate alignment, close tolerances and better fits. 8. High fatigue resistance, maximum endurance and longer life. Ideal for critically stressed parts.

Most of the automobile camshafts



POURING

is Easier, Safer, Faster

WITH CLEVELAND TRAMRAIL

With a complete overhead foundry system such as at the Pohlman Foundry Co. pouring is no more of a task than other foundry operations.

Metal is poured into distributing ladles with safety. By means of the overhead rail system it is easily conveyed to the various floor sections and transferred to the smaller pouring ladles. The latter are pushed to the molds on their individual carriers. It is not necessary to hand-carry heavy ladles of metal.

For greater production — easier, faster, safer — investigate Cleveland Tramrail.

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CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT
Other products: CLEVELAND CRANES and STEELWELD MACHINERY

are SAE 1020 steel carburized and hardened. Graphitic steel shafts are produced to brinell range of 197-241, and cams and gear either flame hardened or induction hardened. Camshafts must resist wear and be sufficiently rigid to give a satisfactory low noise level. The strength of camshafts is secondary in consideration, because if the design and material used is sufficiently rigid it is inherently strong enough.

Many advantages can be credited to graphitic steel as a camshaft material, in addition to savings of pattern expense versus cost of forging dies. These advantages are: 1. Elimination of rough machining of cams. 2. Only one centering operation. 3. Less metal removed in machining. 4. Elimination of carburizing. 5. Better tool life. 6. Easier straightening. 7. Better production on existing equipment. 8. Less finished weight. 9. Added quietness to motor due to damping property. 10. Less handling and transportation due to straight line production.

Figs. 1 to 4 show the microstructures of soft graphitic steels with brinell ranges from 4.30 to 5.10 millimeters while hard graphitic steels with brinell ranges from 3.60 to 4.15 millimeters show microstructures as depicted in Figs. 5 to 8. As cast microstructures of two different section thicknesses are illustrated in Figs. 9 to 12.

Fig. 13 depicts a machine gun slide bracket where at the left the bar stock weighs 4.5 pounds, the rough casting 2.50 pounds, and the finished casting 1.5 pounds. A 25 to 30 per cent reduction in man hours was obtained in machining castings versus bar stock. Fig. 14 shows an automotive reverse internal gear with the forging weighing 8.4 pounds, the rough casting 7.5 pounds and the machined casting 4.8 pounds.

Fig. 15 is a machine gun oil buffer body where the bar stock weighs 8.0 pounds, the rough casting 5.25 pounds, and the machine casting 2.0 pounds. On that a 25 to 30 per cent reduction in man hours was obtained in machining castings versus bar stock. Fig. 16 illustrates a trunnion adapter with the forging weighing 3.6 pounds, the rough casting 2.9 pounds and the machined casting 1.0 pound. A 10 to 15 per cent reduction in man hours in machining casting versus forging was secured. Fig. 17 shows a machine gun bottom plate in which the forging weighs 6.1 pounds, the rough casting 5.7 pounds and the machined casting 2.5 pounds. On that a reduction of 10 to 15 per cent in man hours was obtained in machining castings versus forgings.

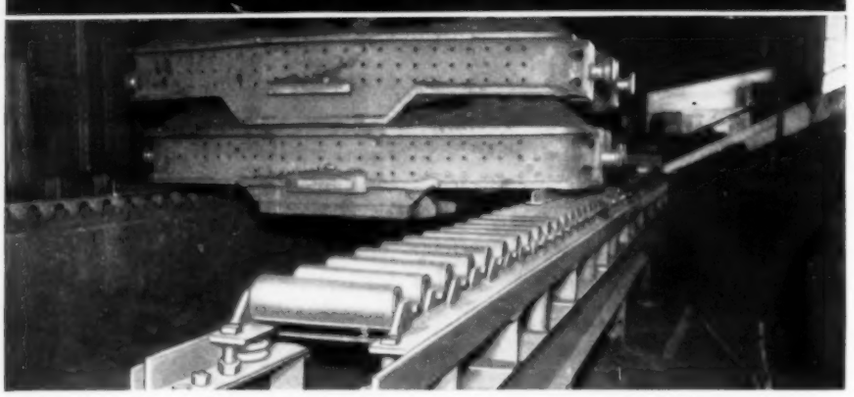
Reduce Machining Time

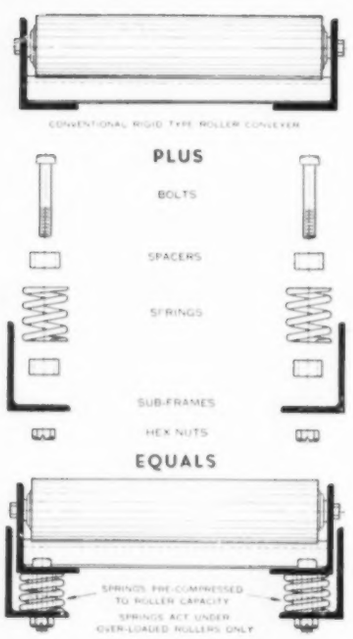
Fig. 18 depicts an automotive front unit drum where the forging weighs 8.2 pounds, the rough casting 5.7 pounds, and the machined casting 3.3 pounds. Fig. 19 shows a machine gun rear sight base with the forging weighing 2.75 pounds, the rough casting 2.2 pounds, and the machined casting 0.5 pounds. A 15 to 20 per cent reduction in man hours was obtained in machining castings versus forgings. Fig. 20 is a machine gun trunnion block where the forging weighs 20 pounds, the rough casting 11 pounds, and the machined casting 6.0 pounds. Reduction in man hours for machining casting versus forging was 30 to 35 per cent.

Fig. 21 illustrated a rear propeller shaft flange and a front universal joint yoke which formerly were forgings of SAE 1145 steel. Quenched in oil and drawn to a brinell range of 255 to 302, considerable trouble was experienced in broaching the splines. Graphitic steel parts produced to a brinell hardness of 207 to 255 eliminated broaching trouble. Parts are highly stressed, and have shown up very satisfactorily. Fig. 22 shows a machine gun top plate with the forging weighing 4.3 pounds, the rough casting 3.9 pounds, and the machined casting 1.5 pounds. A 10 to 15 per cent reduction in man hours was obtained in machining casting versus forging.

Fig. 23 illustrates valve rocker arms formerly produced from SAE 1020 steel, carburized and hard-

MATHEWS SPRING MOUNTED CONVEYERS





SPRING MOUNTED CONVEYER

CUT MAINTENANCE COSTS

THE principle is simple; the roller axles are rigidly locked in the frame as in the conventional "rigid type" construction, but the conveyer frame which retains the rollers is carried on pre-compressed coil springs. The springs are held in compression equal to the rated safe load of each roller. Under impact conditions or excessive loads the springs absorb the overload.

This construction represents the greatest improvement in roller conveyer in many years. Its application will reduce maintenance costs by prolonging the life of the equipment. When conditions are severe, "spring mounted" is the practical conveyer construction for the job.

Capacities from 150 lbs. to 8000 lbs. per roller available.

Ask for Illustrated Folder

MATHEWS CONVEYER COMPANY
104 TENTH STREET, ELLWOOD CITY, PENNA.

CONTINUOUS FLOW PRINCIPLE OF HANDLING MATERIALS

ened, and from SAE 1035 steel, hardened. The pad end was immersed in a lead pot and quenched in water. One customer prefers a soft ArmaSteel with 143 to 179 brinell, and allows a little longer time of heating in the lead bath. Another customer specifies 179 to 207 brinell hardness, and also quenches in oil from a lead bath; immersing the pad end only. Minimum 50 rockwell C on pad is specified. Excellent nonseizing properties of graphitic steel in metal to metal contact has made it possible to eliminate the bronze bushing formerly used on the steel forging.

Fig. 24 shows 8½-inch locomotive diesel pistons used on trans-continental streamline trains which show a remarkable performance up to date. Many engines show upward to 200,000 miles without failure. Pistons of other materials failed at low mileage. Fig. 25 depicts automotive transmission shifter forks which formerly were SAE 1035 steel forgings, gas carburized and hardened to rockwell 60C. The ArmaSteel parts are produced to a brinell range of 207 to 255. At that hardness machining has been found to be satisfactory. The inner surface and one notch on each fork is flame hardened by heating for 17 seconds and quenching in water. Hardening machine is automatic; one man hardening over 6500 forks in 3 hours.

Fig. 26 depicts a machine gun support barrel with the 4-inch tubing weighing 20.0 pounds, the rough casting 6.0 pounds and the machined casting 4.5 pounds. A reduction of 45 to 50 per cent in man hours was obtained in machining castings versus tubing. Numerous other parts also are made from graphitic steel, and include automobile and refrigerator connecting rods, refrigerator crankshafts, etc. Connecting rods formerly were made from SAE 1035 steel forgings. For cast refrigerator rods a graphitic steel of 163 to 207 brinell hardness is being used while for automotive rods the brinell ranges from 197 to 241. Eccentric type refrigerator crankshafts formerly were SAE 1112 or 1020 steel forgings, carburized and hardened to rockwell 60C. The graphitic steel shaft is produced to a brinell range of 170 to 207, which machines readily. After machining it is heated to 1550 degrees Fahr., held 30 minutes, oil quenched, drawn back at 700 degrees Fahr. to rockwell 40C to 45C.

This article is from a paper presented by the author at the Joint Regional Foundry Conference held at Purdue University, Lafayette, Ind., on Oct. 17 and 18. THE EDITORS.

Carroll Clay Co., Carrollton, O., has been incorporated, Robert B. Keplinger, president, to produce refractory specialties for foundries and steel mills.

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MELTING QUALITY CASTINGS

(*Continued from page* 59)

ingredients in the metal charge, namely burnt iron, may have an important bearing on the reduction of silicon and carbon, and therefore, the fluidity. It is a routine practice in our foundry to pour fluidity tests every half hour, and we consider the test a valuable adjunct in the procurement of sound castings.

Probably in no other phase of cupola practice is there a more fitting illustration of the remark made at the beginning of this article about divergent views and methods being employed to arrive at the same result, than that of the metal mixture. There is such a wide variation in the kind and quality of materials used and in such differing proportions, one naturally wonders how we arrive at the same point in the end.

Usually, foundry production schedules, cupola melting capacities and economics are the conditions that determine largely what materials are to be used. As an illustration, take the foundry that finds it necessary to melt a heavy tonnage within a given time per cupola, and yet maintain a specified carbon content in the iron. That foundry should use a coke supplying a quick carbon pick-up to the iron and at the same time use as small amount of coke as possible to meet the production schedule.

It would also be necessary to use a lower percentage of steel and iron scrap in the metal mixture in order to help keep up the specified carbon in the iron. In the case of a second foundry where melting could be accomplished at a much slower pace, it would be much wiser to use a higher percentage of steel, scrap iron and a coke with less carbon pick-up, to produce the same quality of iron.

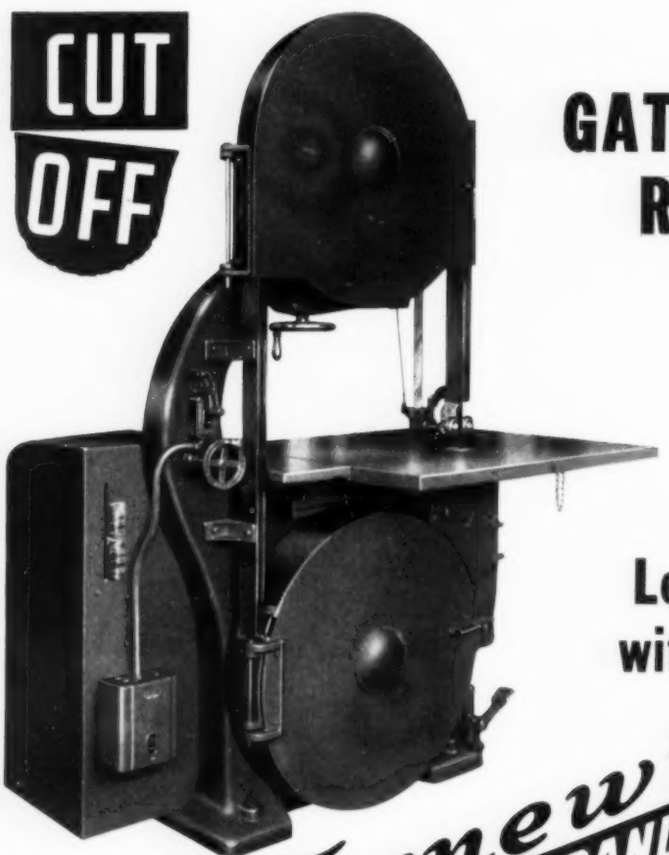
Again, take the foundry that has access to large supplies of steel flashings, bundled sheet metal and briquetted borings. It will naturally use these supplies, whereas, another foundry not having these materials handy, may resort to other materials; such as steel rails, structural steel shapes, cut automobile chassis and rims, scrap cylinder blocks and heads, etc. Some foundries use high silicon pig, others lump ferrosilicon, silicon briquettes, or ground ferroalloys in the ladle, or no alloys at all.

Use Two Mixtures

Cupola mixtures formulated for the same quality of iron, say cylinder blocks, may vary from 15 to 50 per cent in steel content, or cast iron borings from 10 to 40 per cent or more. Here are two cylinder iron mixtures used in our foundry at different periods to produce the identical results. One is a mixture for 28 tons per hour, the other for 18 tons per hour. The first contained 900 pounds steel, 975 pounds cast iron scrap, 800 pounds cast iron borings, 1000 pounds foundry returns, 1700 pounds pig iron, 325 pounds alloy pig iron, and 300 pounds high silicon pig iron. The second mixture for 18 tons per hour contained 2000 pounds steel, 1050 pounds cast iron scrap, 800 pounds cast iron borings, 1000 pounds foundry returns, 500 pounds pig iron, 400 pounds alloy pig iron, and 250 pounds high silicon pig iron.

Note the difference in these two mixtures. With such changes in cupola melting schedules, we have even gone farther than that in having the coke altered in order to control the carbon in the two widely different melting conditions.

The composition of our cylinder iron at the spout is approximately as follows: Total carbon 3.35 per cent, graphitic carbon 2.75 per cent,



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combined carbon 0.55 per cent, silicon 2.35 per cent, sulphur 0.12 per cent, phosphorus 0.16 per cent, manganese 0.65 per cent, chromium 0.35 per cent, and nickel 0.25 per cent. The brinell hardness in the bore is 190 to 205 and in the pan rail 210 to 220. The chill test shows an average depth of ¼-inch.

For small parts iron, such as is poured into water pump bodies and manifolds, an iron higher in silicon and carbon is used. This iron contains less steel in the cupola mixture, and less chromium in order that these smaller castings shall be readily machinable and free from chilled spots. Nevertheless, the structure must be close and the iron possess sufficient strength to fulfill the demands required of it.

A metal mixture containing from 10 to 12 per cent steel and 25 to 30 per cent pig iron, and with a silicon of 2.50 per cent and carbon of 3.50 per cent proves very satisfactory. The chill test averages about 1/32-inch in depth. By combining cylinder iron and small parts iron in suitable proportions a desirable composition may be obtained for almost every purpose, in an automobile foundry. Alloy additions to the ladle may be made for special purposes.

Duplexing Has Advantages

There are two types of hot blast cupolas, both of which give satisfactory results. The two types differ in their source of heat supply for pre-heating the air blast. In one type, which the author calls the internal heat source, the air blast for the cupola is heated by the exhaust gases. In the other design, the air is heated by an external heat source, usually a small powdered coal plant, in which the powdered coal combustion gases pass through checker work or around ducts through which the cupola air blast travels.

The external heat source permits of higher blast temperatures, which under some circumstances may be more desirable. There are advantages and disadvantages in the hot blast cupola. The principal advantages are, higher metal temperatures, from 25 to 50 degrees, less coke consumption, faster melting, more freedom from bridging, and the ability to use a more economical metal mixture, as a larger proportion of steel, cast iron scrap and borings may be used on account of the greater carbon pickup in the metal. There are two disadvantages—higher refractory and maintenance costs.

The term duplexing gray cast iron applied generally to the process of melting iron in the cupola and transferring to an electric furnace for further treatment or mixing. The process is very flexible and permits of an infinite number of metal compositions. It is employed where compositions cannot be made satisfactorily in the cupola, although in many cases it is used as a mixing ladle and for superheating or holding.

By that process the carbon and silicon may be reduced to any desirable amount, through the addition of steel scrap. The reverse is also true, in that these elements may be raised conveniently in amount. Larger additions of alloys may be added without the iron becoming too cold to pour, thanks to the quick and convenient ability of the electric furnace to reheat to any desirable temperature. The author has not observed that duplexing in itself adds any super quality to the metal.

However, by lowering the carbon to 2.60 to 2.70 per cent, and through the addition of alloys, especially molybdenum, molybdenum-nickel, and molybdenum-nickel-chromium, exceptionally strong irons have been obtained, in which large sections of metal having practically no variation in hardness throughout the area. Another very desirable feature of duplexing is

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the ability to easily produce any desirable chill, high or low.

The author's work in duplexing has convinced him that holding iron in the furnace any longer than necessary is detrimental to the quality of the metal, causing loss of carbon, increase in combined carbon, weakness, increased chills, shrinkage cavities and draws and dendritic formations in the casting. For that reason, heats were finished up as soon as possible, or fresh cupola iron added frequently, and at regular intervals. Through the addition of so-called deoxidizer the defects were reduced greatly, usually with an increase in the softness of the casting, sometimes below the hardness limit.

The addition of large amounts of steel to the electric furnace in duplexing causes delay in reheating the bath. By the process of triplexing, in which a cupola, converter and electric furnace are used, this delay is minimized, and a lowering of the carbon requirement does not necessarily mean more time consumed in completing the heat, and by means of this combination continuous melting can be attained with a minimum first cost in melting equipment.

In triplexing, a weighed amount of cupola iron of suitable composition is blown in the converter. During the time consumed in blowing, deoxidizing and alloying in the converter, another tap of iron is weighed out into a mixing ladle, the amount depending on the final composition wanted.

When the molten steel of the converter, now at a temperature of 3000 to 3100 degrees Fahr. is ready, it is poured into the mixing ladle containing the cupola iron and the whole added to the electric furnace. By properly balancing the proportions of steel and iron from the cupola, the composition can be made very close to that required in the finished iron; the electric furnace being used more as a holding unit for more thorough mixing and finishing the exact composition.

The author has not found that the type of tuyere has much influence on the operation of the cupola or the quality of the iron. A number of investigations have shown that there can be quite a wide range in tuyere area without any change in the quality of the iron. In our practice, we prefer to have ample tuyere area and tuyeres of very simple construction. Through the use of sufficiently large tuyeres practically all of the blast pressure is accounted for in the resistance of the passage of air through the stock and not to a restriction at the tuyeres.

Operate on Balanced Blast

As mentioned earlier, the area of our tuyeres is about 25 per cent of a cupola. What is known as "balanced tuyeres" are being operated in a number of foundries, and it is understood with considerable success. The balanced tuyere makes it possible to reduce or cut off completely the amount of air in any tuyere desired. The purpose being to equalize the amount of air entering the cupola at all points, and to reduce or eliminate bridging.

The routine analysis of cupola stack gases for the purpose of controlling the carbon content and temperature of the iron, is of extreme interest to all foundry metallurgists. The procedure of the gas analysis is being simplified through the use of improved mechanical equipment, so that quick and dependable results can be obtained, as to the amount of carbon dioxide and carbon monoxide in the gas.

The ratio of those two gases indicates the trend of the molten metal either towards low carbon, and high chills, followed possibly by cold iron or the reverse. High carbon dioxide indicates that lower total carbons are due, whereas higher carbon monoxide indicates that an increase in total carbon

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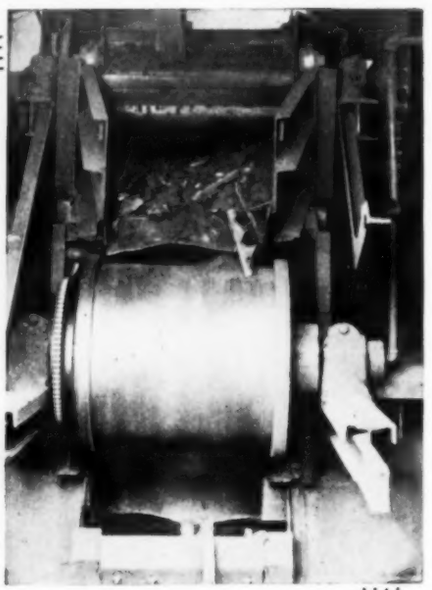

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may be expected. While the author has not had the opportunity to operate with this rather new and interesting equipment, he believes it can be used to advantage in all cupola melting.

Slag plays an important part in the operation of the cupola. It is our endeavor to keep the slag very fluid through the proper addition of limestone and soda ash. We use 175 pounds limestone and 6 pounds soda ash. We also eliminate as much dirt and oxide as possible. We have constructed two large rotating mills through which all of our runner boxes and sprue pass as shown in Fig. 10. This has made quite a reduction in the amount of sand entering the cupola and has contributed largely to our ability to melt faster. The average composition of our slag is as follows: Silica 52.42 per cent, iron oxide 1.86 per cent, alumina 18.00 per cent, lime 24.39 per cent, magnesia 2.03 per cent, manganous oxide 1.02 per cent, and sulphur 0.11 per cent.

Control Cupola Slag

Basic components of this slag, namely lime, magnesia and iron oxide totals 28.28 per cent of the whole, while the acid components silica and alumina total 70.42 per cent. It is thought that a normal slag should have a ratio of 2 parts acid component to 1 basic. Our slag runs 2.5 to 1 in this analysis. If the basic constituents run higher than that in the slag, silicon is likely to be oxidized causing a loss in the silicon. An excess of lime and alkalies will also cause excessive refractory loss. Apparently, the importance attached to the composition of the slag in steel melting is not shared in the gray iron foundry. The author often has wondered if we are not overlooking another means for better cupola control. He believes we are going to see considerable more research on cupola slags in the future with regard to their influence on cupola operations and on the metal.

Height of the coke bed above the tuyeres and the weight of volume of air should be balanced at the start of the heat. A low bed with too much air, will result in low carbons, high chills and frequently cold iron. Too high a bed without sufficient air will cause high carbons, open fractures and if too far out of balance, cold iron.

Cupola melting losses are not as great as generally supposed, that is in properly operated cupolas. To investigate this loss heats have been conducted in which single components were used, adding sufficient silicon in each heat to produce the same silicon content in the iron tapped. The following results were obtained: Cupola mix 1.35 per cent; all steel charges 1.18 per cent; all pig iron charges 1.71 per cent; all autocast charges 1.93 per cent; all malleable charges 7.94 per cent; all loose cast iron borings 23.0 per cent.

The figures show a surprisingly large loss for malleable, which the author is unable to account for. The cast iron borings, by the way, showed an almost white fracture in the test bars. All of the stock was clean material, weighed before charging and all taps were weighed, and checked by weighing the pigs cast from the heats.

Coke is without question one of the most important factors to deal with in cupola melting. To obtain quality iron and efficient cupola operation, there are two points to keep well in mind. The coke must be uniform in its physical properties and composition, and a brand of coke should be used that is best adapted for the existing conditions of melting. The first point hardly needs an explanation. It simply means that the coke plant should use every precaution in its practice to produce the same uniform quality of coke at all times.

In regard to the second point, there can be a marked difference in

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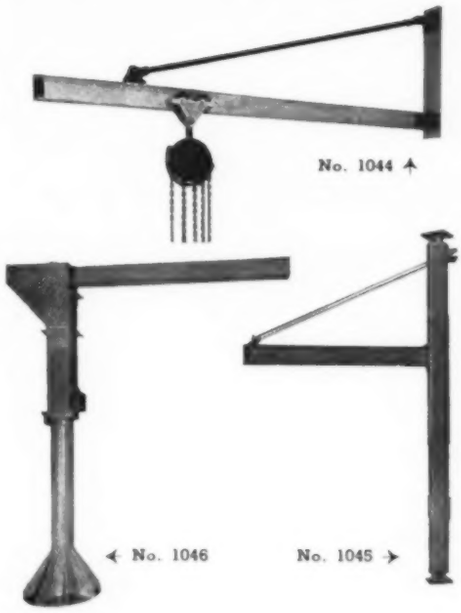

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the behavior of various brands of coke. Take the beehive coke which has been used to a very limited extent in the past few years in cupola melting. The author can see many situations where that type of coke would be ideal. There are a number of beehive cokes that are low in sulphur and ash, and very suitable for use in certain situations.

Generally speaking, other things being equal, iron melted with beehive coke will run about 0.10 to 0.15 per cent lower in total carbon than is obtained with most byproduct coke; the chill is deeper, the fracture close, and there is considerably less tendency for the iron to pick up carbon during shut-downs. The melting rate is slower. All brands of beehive coke, of course, do not give the same results any more than do byproduct cokes.

Our foundry has used beehive coke with considerable success in the past, and it was common practice to specify combinations of various proportions of beehive and byproduct coke to produce the desired amount of carbon for the schedule of melting at the time. At the present time we are using two brands of byproduct coke; one for our cylinder iron cupolas and the other on small parts iron.

With this quality of coke we are able to melt 30 tons of iron per hour in a cupola lined to 72 inches and boshed down to 68 inches at the tuyeres. At this melting speed it is a constant battle to hold our carbons up to the minimum specified limit. The principal objection to this quality of coke is its tendency to cause quick carbon pickup by the iron if the cupolas are shut down for five or ten minutes. When these shut-downs can be anticipated, particularly during the noon hour, extra steel and silicon are added to the iron charges to compensate for the extra carbon.

Refractories commonly used in cupolas are fire brick—9-inch straights and splits, cupola block and firestone, which is sandstone mined from quarries, fireclay, lake sand, silica sand, and molding sand. Other refractories of more special application are refractory sands sold under various trade names, air setting and fire setting ramming mixtures and refractory cements. Our tests on refractories are generally of a practical nature and consist in the installation of the material in the cupola or ladle as the case may be, alongside of a material which has already been classed as standard for that particular use.

As an example, when we try out a new brand of cupola block, we line one half of the well with the unknown and the other half with the standard block. In the next installation in the same cupola we reverse the positions of the two brands. By keeping a record of the date of installation and an examination following each heat we arrive at a very reliable opinion of the quality of the product used in the cupola.

This is the concluding article of two from a lecture presented by the author at a foundry course sponsored by the Detroit Chapter of the American Foundrymen's Association. The first appeared in the November issue.

THE EDITORS.

Films Available

University of Iowa, Iowa City, Iowa, has issued an extension bulletin listing its industrial engineering library of motion and time study films, which are available for loan. Films in the library, originally established for use in connection with courses given by Ralph M. Barnes, professor of industrial engineering, at the university, now are available for loan to schools and industrial plants. Copies of the bulletin may be obtained from the department of visual instruction, extension division, State University of Iowa, Iowa City, Iowa.

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USE INTERNAL CHILLS IN CASTINGS

(*Continued from page* 61)

extending from the cavity to the casting face. If the casting is operating under pressure, leaks may develop.

"In general, the problem of removing the possibilities of defects due to contraction results in the elimination of the hot spots in castings. These isolated hot spots are sources of great trouble in the manufacturing of steel castings, and anything that the designer could do toward eliminating them would be greatly appreciated by the foundryman."

At another point in their paper, under the heading "Chilling of Steel Castings," the following was stated: "Proper chilling is also an important factor in the production of sound castings. There still are sections of castings which it is impossible to feed and in these cases the foundryman's only expedient in the production of sound castings is the chill.

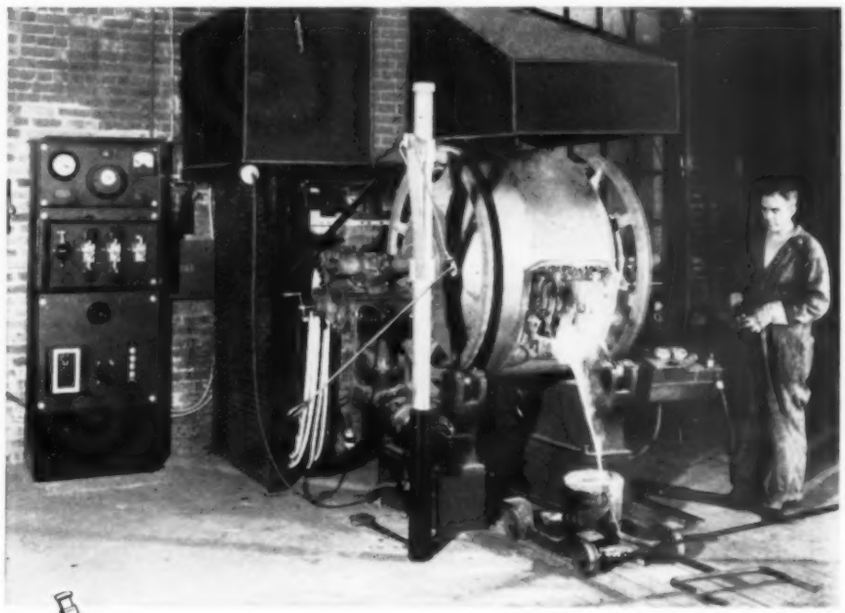
Fig. 17—Internal chill designed for castings with unequal metal sections

"There have been many arguments concerning the use of the external and internal chills. The authors prefer the use of external chills for several reasons. The size of the chill employed is important where either external or internal chills are used, as the effect of the chill may prevent feeding if too large, and fail to accomplish anything if too small.

"With internal chills, other factors arise. The chill must fuse into the cast matrix if a perfectly sound casting is to be obtained. The chill must be absolutely clean and dry if blow holes or porous spots are to be eliminated. In green sand practice the chills can easily be inserted just prior to closing the mold and the cleanliness of the chill is comparatively easy to control.

"This is not always true in dry sand practice, for if the chills must be inserted into the green mold, the fumes from the organic binders leave a deposit on the chills when the mold is dried, which invariably causes trouble in the finished casting."

Taylor and Rominski made a study of coatings for chaplets in an effort to find that coating which is most practical in preserving cleanliness of chaplets, and an aid to fusion. In that connection they made these comments—"Chaplets are only a specialized form of internal chill, it follows that the development of a suitable coating for the former would provide an important tool for the treatment of many solidification problems. In a series of tests conducted by co-operating industrial



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foundries, the copper plate was found to give the most consistently good results of any tried. Included in the work was a tin dipped series. Internal chills, giving good fusion at a corrosion free surface, would enable their use to great advantage in those cases where poor design or necessity demands it."

So long as designer's ideas of proper design do not conform with those basic principles which govern the shape of castable structures, it befalls the foundryman either to recommend a more castable design or to circumvent as best he can the disadvantages inherent in the design with sheer foundry technique.

In discussing chills, the author would like to both indicate and emphasize the importance of the shape of design of chills plus their placement and position in the mold.

Fig. 2 is a cast steel hub cap which is about twelve inches in diameter and weighs approximately fifty pounds. The metal sections throughout the casting are fairly uniform, excepting the eight bosses equally spaced about the periphery of the casting. They are eight hot spots.

Fig. 14 is a steel casting called a spindle, weighs about 225 pounds. Its greatest dimension, across the bell end, is about 23 inches. A number of isolated hot spots appear in the casting in the form of bosses of varying sizes.

Fig. 7 is a steel casting known as an axle housing, weighing about 600 pounds, is about 44 inches long and its greatest cross dimension is approximately 23 inches. In this casting there are also a great number of hot spots. Place the mold for this casting in any position for pouring and bosses, or hot spots, will be found in almost every conceivable directioin. These bosses vary in depth from 1½ inches to 5 inches.

In this casting there are 54 hot spots that are machined, either faced, drilled, or drilled and tapped. It is believed that one will agree that the production of this casting might call for a little foundry technique.

Such characteristics as displayed in these three castings are not uncommon in the general run of commercial castings.

Unless the cooling rate in the different portions of a casting of unequal metal sections is maintained substantially uniform, defects are produced, such as piping or internal

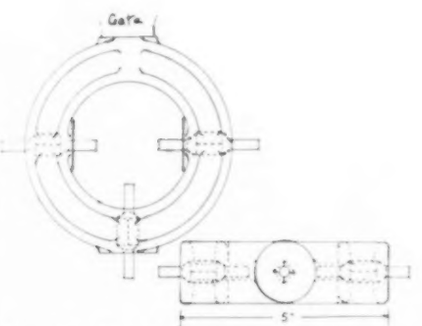

Fig. 18—Sketch of casting shown in Fig. 9

shrink cavities. Various means have been developed in an effort to eliminate the faults mentioned. Among these the most effective have been internal chills.

These have been in the form of wire coils, masses of cold metal and nails, the chills being placed in the molds where they have been surrounded by and fused to the molten metal. As the chills are of the same kind of metal as that being poured and as they tend to equalize the cooling rate, the method described has in some cases resulted in elimination of the defects heretofore mentioned. In many cases, however, the chills now used produce defects of a different type known as "chill kicks" or "blows."

These defects are formed by trapping gases generated by the sudden envelopment of oxidized or corroded chill surfaces or surfaces containing moisture or other accumulations convertible into gas by heat. Sometimes they are more objectionable

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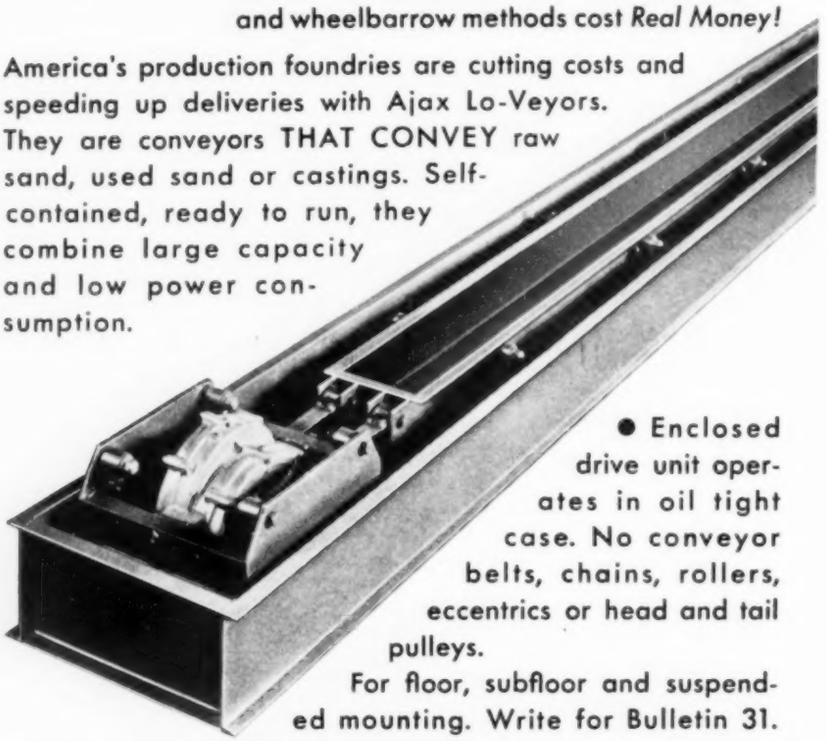

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than the "piping" or "cavities" mentioned and, consequently, internal chills are being used with a degree of uncertainty for accomplishing their purpose.

It was due to the three castings shown that the management at Burnside Steel Foundry gave more than usual thought to internal chills. Some tests were made using a number of kinds of internal chills, both home-made and commercial. In making these tests a small pattern shaped like a connecting rod was used, which had a heavy boss on one end and a smaller diameter and shorter boss on the other.

In Fig. 11 the pattern is shown with two sizes of gates that were used in casting test specimens. The pattern is 8 inches in length, the diameter of the small boss is 1¾ inches, and the diameter of the large boss is 2¼ inches. The connecting bar is ¾-inch thick and tapers from 1¾ inches wide at the large boss to 1⅜ inches wide at the small boss. Pieces were cast with two different lengths of large diameter bosses, without chills and with several sizes and types of chills.

Fig. 8 is a casting made up with the short heavy boss, cast with the small gate and no chills. It will be noted that shrink cavities appear in each boss as might be expected.

Fig. 12 shows the long heavy boss. This piece was cast with the large

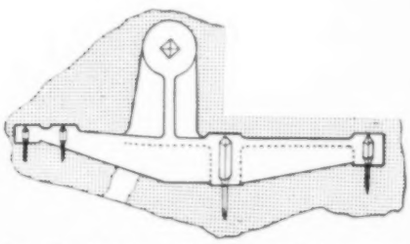

Fig. 19—Cross section of bracket casting

gate and without chills. The casting displaying shrink cavities similar to those in the previous casting. It is well to state here that in casting specimens using the small or large gate, there was little or no difference in structure displayed in the bosses. However, there was a difference in the centerline structure of the connecting bar, the large gate produced a more dense structure in the metal immediately adjacent to it.

Fig. 1 shows the test piece, cast with the large gate. Two types of chills were used, in the large boss a 40-penny cut nail, and in the small boss the elongated head, horseshoe nail type of chill. The cut nail has been used quite extensively as an internal chill because of some good features. It is cheap and very convenient to handle. However, from this illustration it would seem the good features are far outweighed by the bad ones.

The type of defects shown here are very common with the cut nail and are due chiefly to two things. First, lack of cleanliness of the chill, the cut nail usually carries quite a little oxide scale on its surfaces. The second bad feature of the cut nail is its shape. You see directly over the head of the nail quite a cavity. This kind of defect is very common with the cut nails and also with horse-shoe nails.

Fig. 10 is a section of a casting showing the horse-shoe nail and the defect which so often accompanies its use, when the nail is placed in the drag.

Fig. 4 illustrates the use of coil chills. It is believed that most operators have found defects similar to those shown here. The coil chill is bulky, has a high ratio of surface to mass and its effect as a chill does not extend far beyond the chill as you can see in the etched specimen. Too often gas is trapped inside the coil and when they are used in bosses this is as serious as a shrink cavity, as it will cause drill breakage, or lead off of the drill. The shape of the coil is such as to encourage the holding of dirt and trapping of gasses.

Fig. 16 shows the elongated head,

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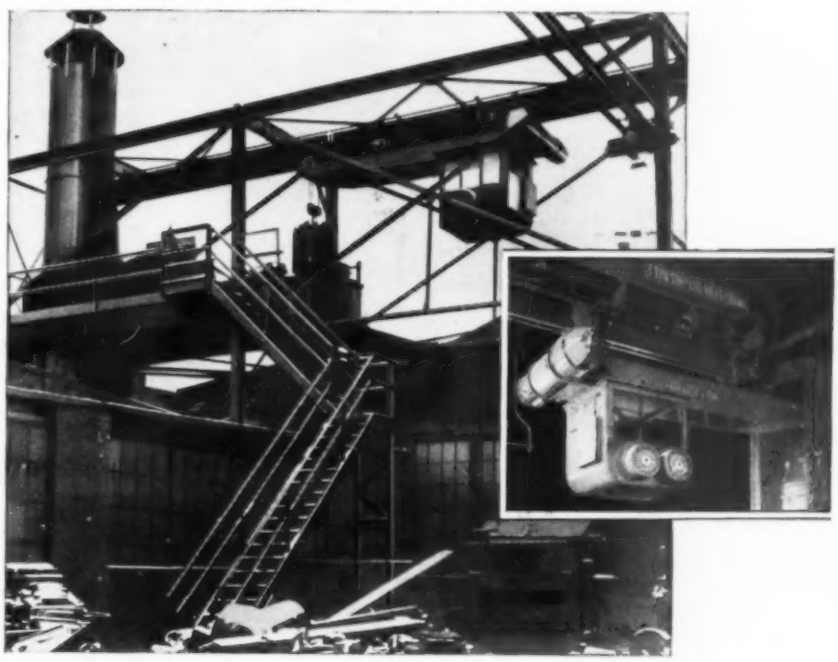

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horse-shoe nail type of chill which has a higher ratio of mass to surface than the coil chill, its use is limited to small bosses if it is to be removed by drilling. This figure brings out its lack of effectiveness in large bosses, the chilled area being of insufficient size to eliminate the shrink cavity in the boss.

Figs. 1, 4, 10 and 16 point out objectionable features in the use of the common types of internal chills.

In experimenting with internal chills is has been found that when nails were used as chills with their points up, the "blows" were less objectionable than where they were supported with surfaces, and more especially their top sides, in horizontal planes. Further experiments disclosed conclusively that by the use of chills specially shaped and positioned so as to eliminate horizontal surfaces, the "blows" or "chill kicks" were eliminated. Also, as the rate of cooling is equalized, through the selection of proper size chills, the produced castings generally have been free from defects.

Fig. 17 shows the internal chill specially designed for eliminating defects within castings having unequal metal sections. Also shown is the double end chill and the brass head marking tacks which are made up in the same square dimension sizes as the chills. Both will be referred to later.

The object of this design is to provide internal chills so shaped that they can be positioned in the mold so that there will be no horizontal surfaces, but, on the contrary, the top surfaces will all converge upward to points or lines so that no top surface will have all portions enveloped instantly by molten metal.

A further object of the shape or design is to provide internal chills having upwardly inclined surfaces along which gases are free to flow as quickly as generated following contact of molten metal with the surfaces so that the submergence of each chill is thus gradual and ample time is afforded for the escape of any generated gases before the chill is completely submerged and fused.

Fig. 21 is a schematic illustration of the chill placed in several positions and being enveloped by molten metal, showing gases escaping along the inclined and vertical surfaces.

It is obvious that when this chill

Fig. 20—Cross section of hub casting shown in Fig. 2

is placed in the mold with its longitudinal center in a horizontal or in a vertical position, the chill can be so located that all of its surfaces will incline upwardly so that there will be no horizontal top surface.

Thus, regardless of whether the chill be placed horizontally or vertically with the head either uppermost or lowermost, in any case the chill will have all of its surfaces inclined upwardly, the lower surfaces diverging upward from a low point or line while the upper surfaces will converge upwardly toward a high point or line.

As the molten metal is poured into the mold and as the level therefore, rises gradually within the mold the lowermost chill or chills will be gradually enveloped, but at no time will an entire surface be completely enveloped instantaneously as would occur should one of the top surfaces be horizontal.

Consequently if the chills have surface accumulations of any substances which would be converted into gas when contacted by the molten metal, the gases thus generated would be released upward in advance of the rising surface of the molten liquid as fast as the level of said liquid contacts with the chill and causes the gas generation.

Thus the gas will not be trapped along any portion of the chill but

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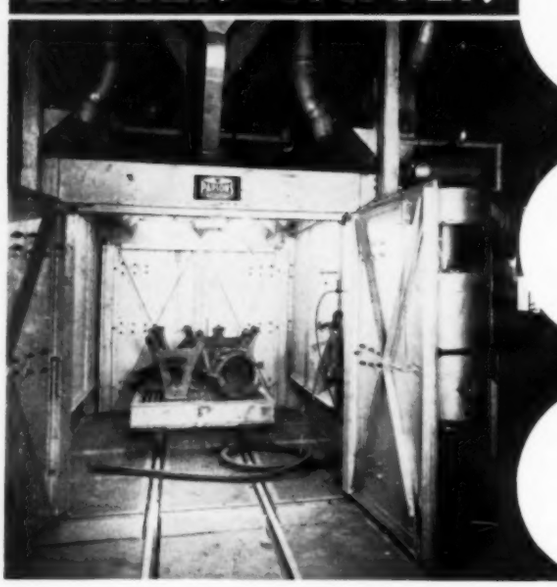

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will escape along the inclined surfaces thereof until the uppermost point or line of the chill is reached. Therefore, there will be no formation of a "blow" or "chill kick" and as the chill also serves to equalize the cooling rate, the resultant casting generally will be found free from all of the defects heretofore resulting from the use of internal chills.

Fig. 13 shows the "super chill," the tradename given it by the manufacturer, among the other chills in common use, such as the cut nail, the horse-shoe nail, the coil chill, round bar stock, square bar stock and the common nail.

In Fig. 5 two views of the long hub casting are shown. The upper figure shows the long hub cast in the drag, with a ½-inch square chill and in the lower figure the long hub was placed in the cope and a ⅝-inch square chill was used. One of the important and desirable features of the "super chill" is its high ratio of mass to its surface area. It is mass

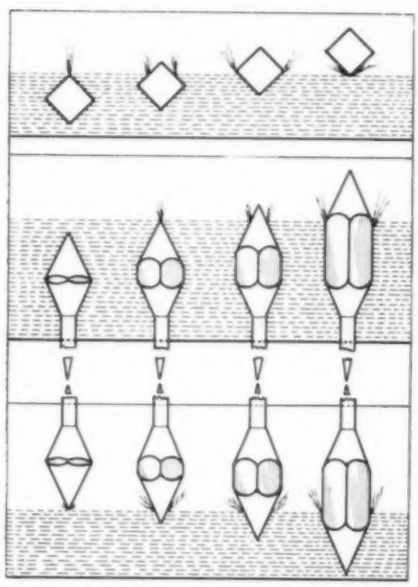

Fig. 21—Schematic illustration of chill placed in several positions in molten metal

and not surface area that gives effective chilling.

Attention is called to the extent of the dense structure surrounding the chill which demonstrates the chilling effect of mass.

It will be noted that there are cracks in the dense case surrounding the ⅝-inch square chill, this brings out the importance of size of chill to be used. It has been found through experience that a good rule to follow is to use a chill with a square dimension equal to one-fourth the diameter of the boss in which it is placed. If the designer has used standard engineering practice this size chill will be completely removed in the drilling of the boss.

Fig. 15 shows the short hub casting with a half-inch square chill in the large boss and a three-eighth inch square in the small boss. Attention is again called to the dense structure of the bosses.

Fig. 9 shows a sectioned casting which is a comparatively simple one. It contains four hot spots so positioned that the placing of chills in a horizontal position seems desirable. Here again is good dense structure throughout the bosses.

Fig. 18 is a sketch of the casting shown in Fig. 9 bringing out the practical use of the double end chill, not only from the molding and casting standpoint, but also from the cleaning standpoint. The diameter of the tail on the chill varies with its square dimension making it possible to place a tail print on the pattern indicating the size of chill to be used.

In cleaning that casting, it is much cheaper to remove the reduced tail than it would be to remove the full size square. Also the results in appearance of the casting favor the reduced tail.

Molders should be instructed to always place these chills so that their flat surfaces are inclined to-

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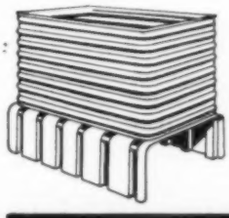

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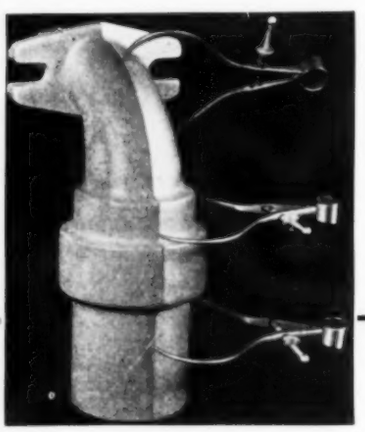

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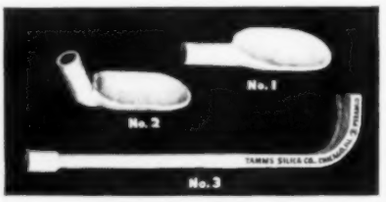

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ward a perpendicular plane.

Fig. 19 shows a cross section of a bracket, illustrating the use of several sizes of chills, placed in both a vertical and a horizontal position. The chill shown in the horizontal position is placed in a core and its position and size are indicated in the core box by the marker tack.

Fig. 20 is a cross-section of the hub casting (Fig. 2) showing the position of the chills and the position in which this piece is cast, with risers over the center hub.

Fig. 6 points out how chills are placed in a core. Their correct size and position are assured by proper marking of the core box equipment.

In Fig. 3 there are shown a few simple patterns to illustrate the marking of patterns. It is a practice at Burnside Steel Foundry Co. to mark with paint all loose patterns indicating the size and position of risers, the gating, the matter of tipping molds, and the location of external chills.

Does this not suggest the adoption of a standard practice of marking patterns indicating the size and position of internal chills? The square and pointed tack is an excellent marker. It not only indicates the size and position of the chill but provides a small amount of metal to be chipped off with the stem of the chill. It also prevents the cavities about the chill stem which are due to sand crush and is an aid to a finer appearing finished product.

Eliminate Horizontal Surfaces

To emphasize the importance of the shape or design of chills, plus their placement and position in the mold, the author reiterates that by the elimination of flat horizontal surfaces and the utilization of surfaces which are inclined or rounded upwardly as in this "super chill" gases are free to flow upwardly along said surfaces as fast as generated and before they can become enveloped, so that the resultant casting is free of otherwise produced defects.

In conclusion, it is suggested that deprecative remarks regarding the use of internal chills in the making of small steel castings should be made with qualifications, as there is very definitely a place for their use in the production of good sound castings and their use in these places should be considered good foundry practice.

This article is from a paper presented by the author at the technical session held during the annual meeting of the Steel Founders' Society of America at the Edgewater Beach hotel, Chicago, early this year. At that time the author was manager of operations, Burnside Steel Foundry Co., Chicago. He now is executive vice president, American Foundrymen's Association.

THE EDITORS.

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Quality---Service

Display Castings At Metal Show

(*Concluded from page* 63)

conservation and substitution in the production of alloy steel and iron castings. The meeting was held under the direction of co-chairmen A. L. Boegehold, Research Laboratories division, General Motors Corp., Detroit, and C. H. Lorig, Battelle Memorial Institute, Columbus, O. Ernest E. Thum, editor, *Metal Progress*, spoke briefly on the heavy demands of alloying agents for defense purposes leaving little if any for non-defense work. Even on defense work it becomes necessary to hold the alloys to the minimum point to obtain the desired effects so that the available quantity may go farthest.

A. W. Demmler, Vanadium Corp. of America, discussed the function of nickel, chromium and vanadium that are scarce while G. F. Comstock, Titanium Alloy Mfg. Co., talked on function of silicon, titanium and phosphorus that are more plentiful. J. E. Jackson, Copper Iron & Steel Development Association, spoke on the function of copper, and V. A. Crosby, Climax Molybdenum Co., discussed the function of molybdenum and utilization of classified scrap and alloyed pig iron.

Situation in various important industries was presented by several speakers including the following: H. S. Austin, Buick Motor division—automotive; Samuel Z. Krumm, Buckeye Steel Castings Co.—railroad; Norman L. Mochel, Westinghouse Electric & Mfg. Co.—power; Francis B. Foley, Midvale Co.—chemical and petroleum; and Hyman Bornstein, Deere & Co.—agricultural machinery.

Consensus was that alloys in general must be used carefully and sparingly to make the available supply to the greatest good in those applications where the use is essential to meet service requirements. In many applications use of other than alloy castings could be made through changes in heat treatments, machining and other practices.

Hold Sand Clinic

A clinic on foundry sands was held Oct. 24 at the Mayfair Hotel, St. Louis, by F. E. Schundler & Co. Inc., Joliet, Ill. This is one of a series of similar meetings, the most recent dealing entirely with synthetic sands. Charles B. Schureman, technical consultant of the Schundler company, was discussion leader for the evening. The meeting was attended by a large number of operating heads of foundries in the St. Louis district, and developed considerable discussion on various phases of the subject.

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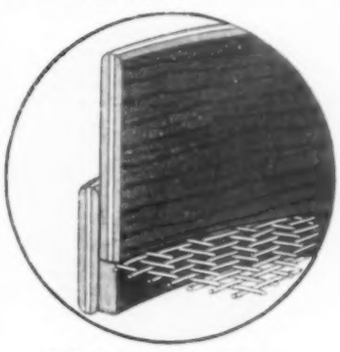

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PLANNING THE NONFERROUS FOUNDRY

(*Continued from page* 64)

reach an exit. Movement along the underside of the roof permits of the loss of heat and a resultant falling of the cooled vapors and the destruction of the objective of proper ventilation.

It will be seen then that a roof made up of a series of pockets with adequate outlets into which each upward current of air is led directly to the ventilating exit, offers the most promising method of eliminating the atmosphere that should be ejected from the foundry in order to insure satisfactory ventilation. In the nonferrous foundries, particularly those producing bronzes and brasses, some of the fumes are most unpleasant to the men and in a few instances they affect the health. Therefore good ventilation must be one of the prime requisites in the design of the ideal foundry.

Consequently, we believe that a foundry made up of two or more parallel sections, each of which is roofed over with a saw tooth roof in which ample glass gives good illumination and ample ventilation is provided by plenty of free outlets. Such a foundry design will produce an opportunity for the free venting of all objectionable atmosphere particularly if provision is made for the supply of the necessary fresh air by ventilating apparatus to replace that which is passing out through the roof vents.

Reduce Gas Travel

Obviously each section above suggested should have its own series of saw teeth each of which is a unit in itself so that the gases do not have to travel far; in fact cannot travel far along the peak of this saw tooth before finding free vent openings and necessarily are pocketed in this one short tooth so that they retain the maximum amount of heat to reduce the chilling effect of the contact of the air with the roof material.

In the study of ventilation of the foundry the position of the furnaces has a material influence on ventilation. Waste heat from the furnaces produces a marked temperature difference between the furnace department and other parts of the foundry. To utilize the temperature difference so that it augments ventilation and helps rather than hinders satisfactory ventilation for the foundry should be the ambition of the engineer having this design problem in charge.

In Fig. 1 we have illustrated the

■

EXPERIENCE

Nonferrous, gray iron, malleable and steel foundries are extensive users of power driven machinery and new devices and equipment are constantly being developed and installed. Small jobbing foundries also have found it profitable to install low cost labor-saving equipment. The market offers a great variety of standard equipment designed to insure progressive flow of materials from the stock bins to the finished product.

■

PLANNING

The first step in laying out a new plant or planning new extensions and modernization is to ascertain the exact requirement and provide ample flexibility to cover future needs. The only problem involved in selecting and specifying mechanical equipment for materials handling, continuous melting, molding, pouring, cleaning, etc., is to make sure that the capital expenditure will yield the largest possible return on the initial investment.

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cross section of a foundry without any dimensions as to relative width of the different sections but indicating the position of saw teeth on each section and also indicating the fact that one section may be higher than the other if there are conditions such as crane ways etc. that require such design. However, these sections may be all of the same height but a definite wall should be provided between the saw teeth of each of the sections so that the saw tooth does not run continuously across the foundry from the point marked *A* to the point marked *B*.

That will insure the hot gases having only a short travel when they reach the back of the saw teeth of the width of only one section and consequently they perforce must pass out of the vents of that section. In this question of ventilation we have been discussing it from the standpoint of building design only here; later on we will discuss it with respect to the provisions of ventilating apparatus.

Another factor that influences the design of a foundry materially is the location of the railroad siding or the location of the street as to how material may come into the plant and be taken away so that it is difficult for us to outline here a foundry that would embrace all the ideal characteristics one could anticipate but there are a number of ideals that one should shoot for anyway.

Reduce Handling Expense

For example, if a siding is available, and the supplies coming in are going to be brought in carload lots, they should be placed in supply sheds adjacent to the siding but so located that a minimum of labor expense is necessary for their delivery to the department in the foundry where they are going to be used. Incoming metal should have a metal storage that is adjacent to the furnace department but is separated from it so that accurate inventories may be maintained, accurate check or charges may be at all times available.

Metal storage also should be arranged so that heats for individual furnace charges may be made up with a minimum amount of labor trouble and accurately controlled to insure accuracy of resulting product. The sand and refractory materials should be stored adjacent to the railroad siding and should be so accommodated that different grades of sand may be kept separate from one another, the core sand handy to the core room and the molding sand easily accessible to the foundry for addition to the sand heaps.

In the mass production foundry where the sand is to be mixed by machinery and delivered by conveyor through hoppers above the molding machines it becomes an easy matter to plan for the position of

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the sand mixing apparatus at a point adjacent to the sand storage. However, in the foundry where mechanical sand handling equipment is not available it may seem difficult to plan for economical distribution of the sand to the different molding floors. If the layout of ground will permit the proper consideration of this problem in the first place it will materially help to reduce labor charges later on for the sand bins may be located where they can flow freely to the floors without an undue cost for handling.

Fuel likewise must be located convenient to the siding or to the incoming driveway so that economical service of this type of supply is insured but it should be remembered that this fuel must be later on delivered to the furnaces. Therefore an economical service from storage to furnace may be found to be more important than the question of economical position of the storage with respect to the siding or incoming driveway. Such problems must be considered carefully for it should always be remembered that labor charge after the installation of equipment is a daily expense and anything that can save this labor charge from day to day will materially reduce the cost per pound of product.

Provide Pipe Passageway

One satisfactory step in connection with economical service of fuels from storage to furnaces is a passageway under the floor which carries all pipes for oil or gas and where such piping may have periodical inspection for maintenance and repair. If coke or coal is to be the fuel the passageway also may be utilized to good advantage for the movement of this solid fuel to the furnace and the removal of ashes at the end of the day. It simply means that the passageway must be designed to accommodate such traffic. It will be also found desirable in planning to accommodate in this subway main line water pipe, main line air pipes and the main line electric conduits provided proper attention is paid to adequate installation and adequate drainage.

Such a subway should be drained properly and preferably ventilated properly to avoid undue moisture resulting in rusting of pipes and to avoid serious trouble with electrical installation. Once such a subway is installed in a foundry it will be found to be an economical part of the design as it insures ease of repair and consequent low cost of repair and most favorable of all a minimum shut down expense because of necessary repairs.

We have spoken of adequate natural illumination. That means adequate window space and there are a variety of good windows available the choice of which is influenced by local conditions. However daylight is not always available at its best and consequently adequate artificial illumination also must be provided to insure the best product by reason of ease of vision on the part of the operators. Good illumination is a real economy and the modern electrical illumination engineers daily are improving their knowledge of the subject to such an extent that it would be fool-hardy for any engineer designing a foundry to lay down the best type of electrical illumination without first consulting with engineers that are specializing in this subject of illumination and thus make sure that to get the latest in apparatus and equipment so that maximum light is available at a minimum current consumption and consequently a minimum cost. This is one of the features in which modern foundries differ from old time dark, gloomy shops.

This is the first of a series of articles on the subject of planning a nonferrous foundry. Others will appear in succeeding issues.

THE EDITORS.

Firm Celebrates Progress Made

On Oct. 25 the Enterprise Engine & Foundry Co., San Francisco, celebrated 55 years of continuous progress with a banquet dedicated to the founders of the business. In the Fall of 1886 four young men, Henry Martens; J. W. Heaney; J. H. Shrader and Albert Anderson, entered into a partnership to operate a general jobbing foundry. Of the four Henry Martens and J. W. Heaney are still actively participating in the management. Albert Anderson retired some time ago, but remains devoted to the ideals of the company. Charles Hoehn who served his time in the shop has been president for many years.

Firmly believing in the future industrial progress of the West the young men purchased the Old Ziegler's foundry and started production. In the ensuing two decades with addition to facilities and scope of foundry work, the firm rapidly took a place as one of the leading foundries in the San Francisco area. In 1918 Enterprise Engine & Foundry Co. developed a series of heavy duty, distillate burning engines, and in 1921 developed a four cycle, heavy duty, full diesel engine. During the 20's and early 30's the firm engaged in production of other manufactured products including horizontal rotary oil burning equipment, vertical mills, horizontal screw presses and other equipment. In 1934 the company developed modern, lighter weight and higher output diesel engines.

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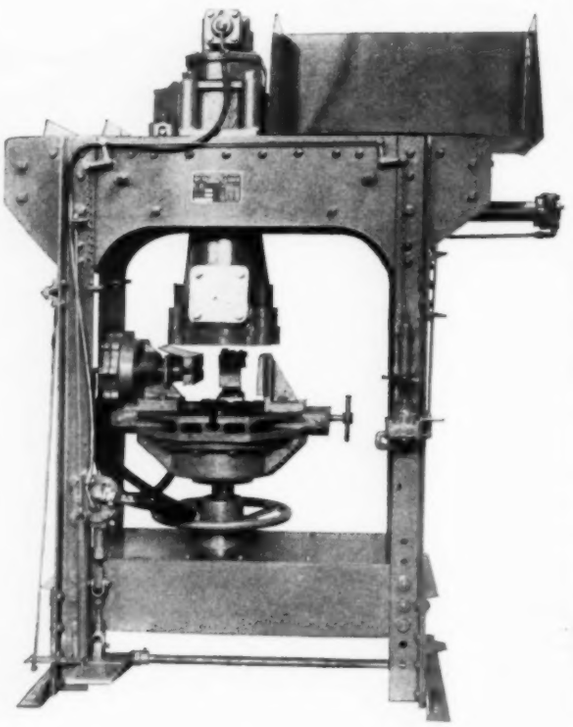

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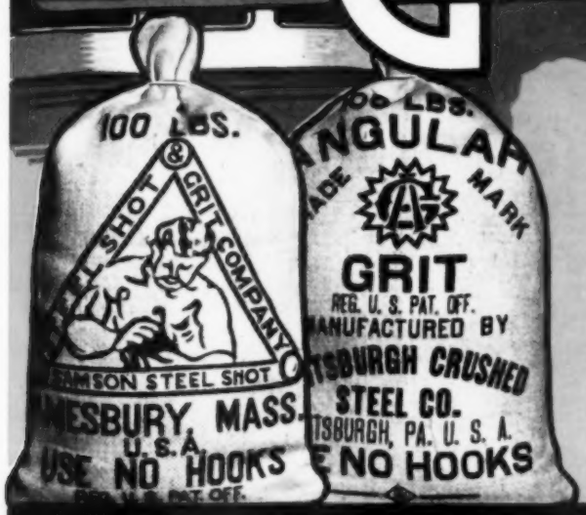

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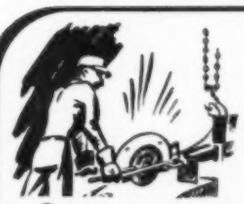

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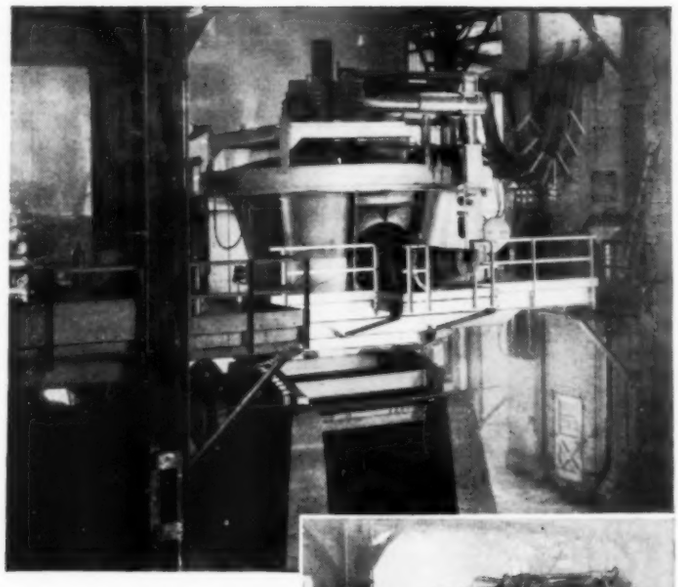

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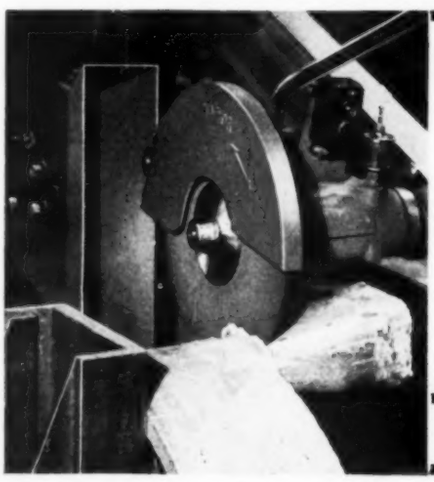

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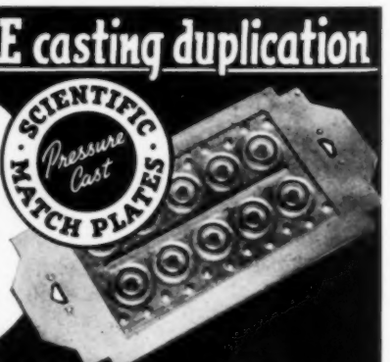

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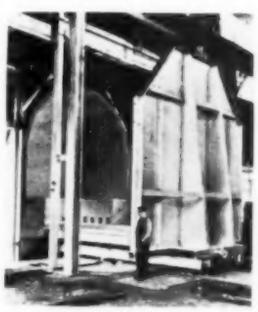

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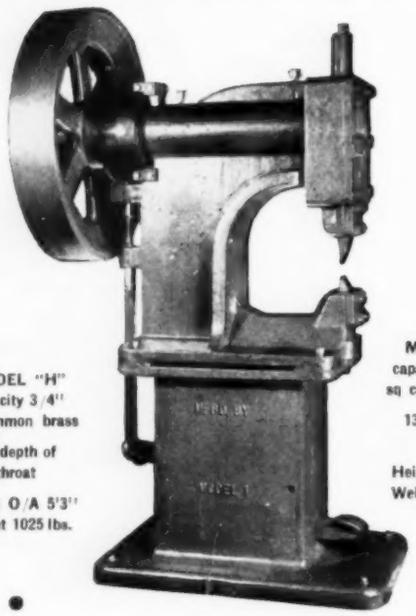

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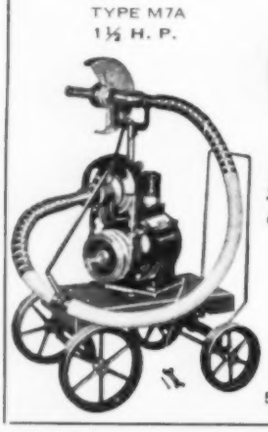

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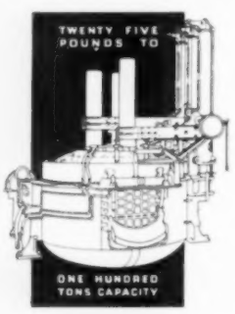

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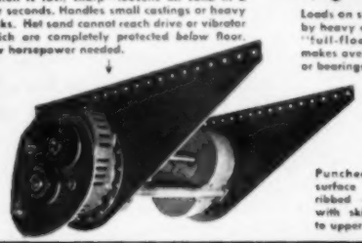

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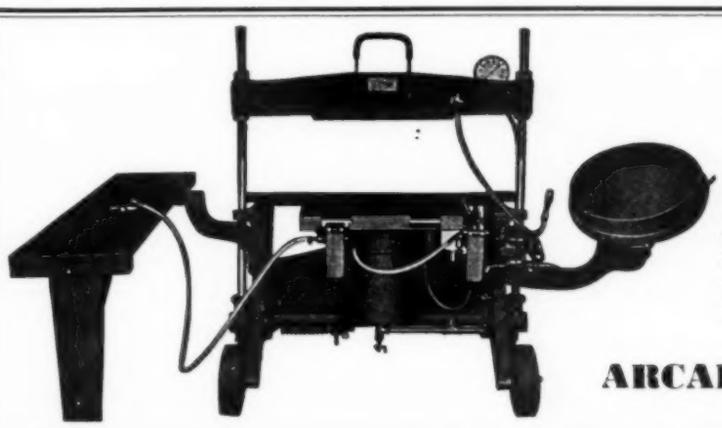

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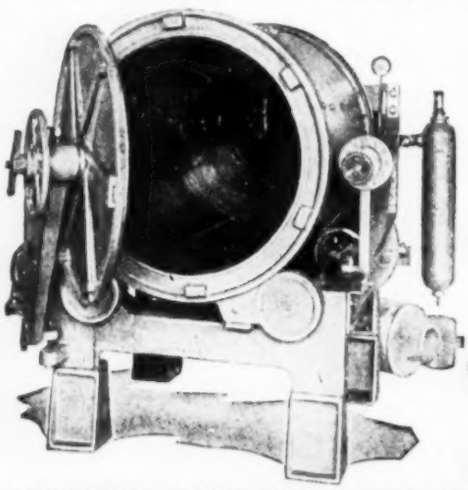

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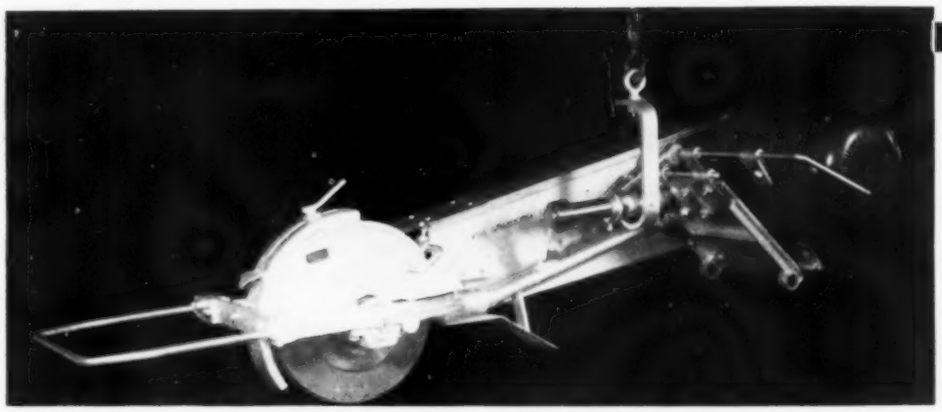

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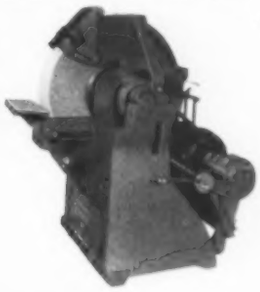

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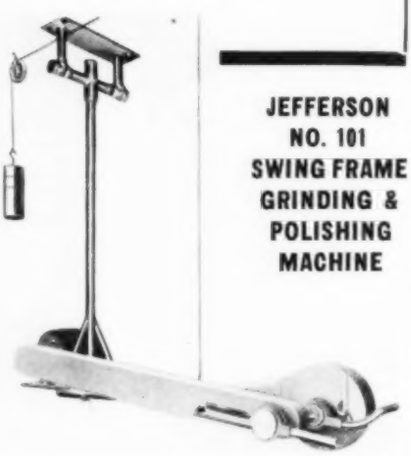

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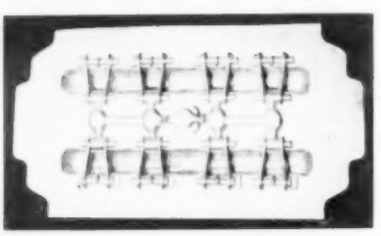

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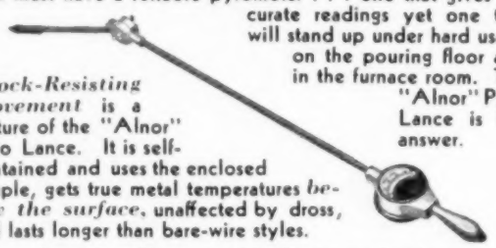

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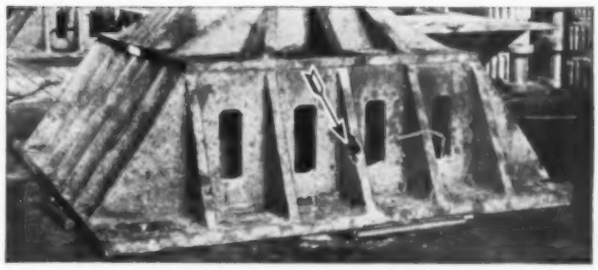

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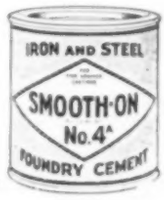

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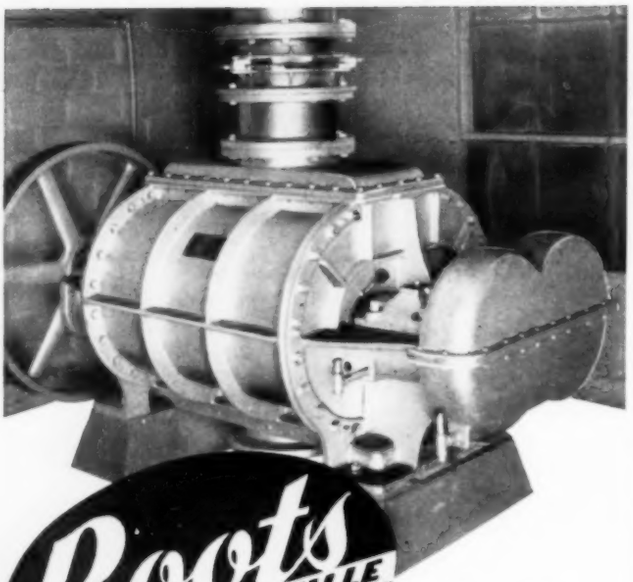

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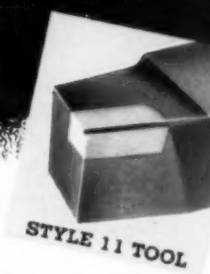

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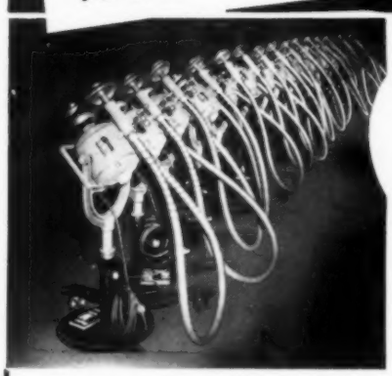

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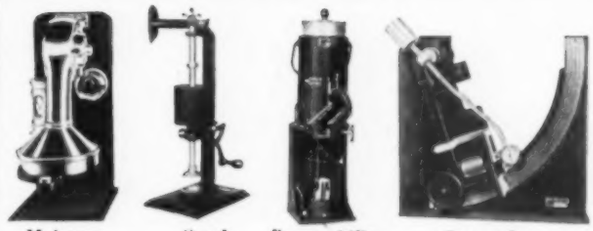

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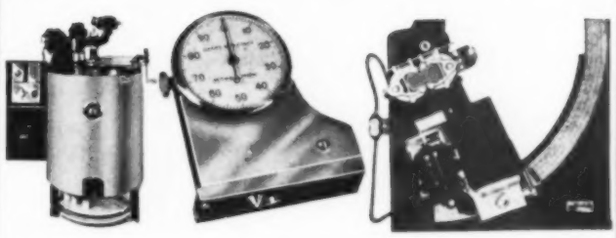

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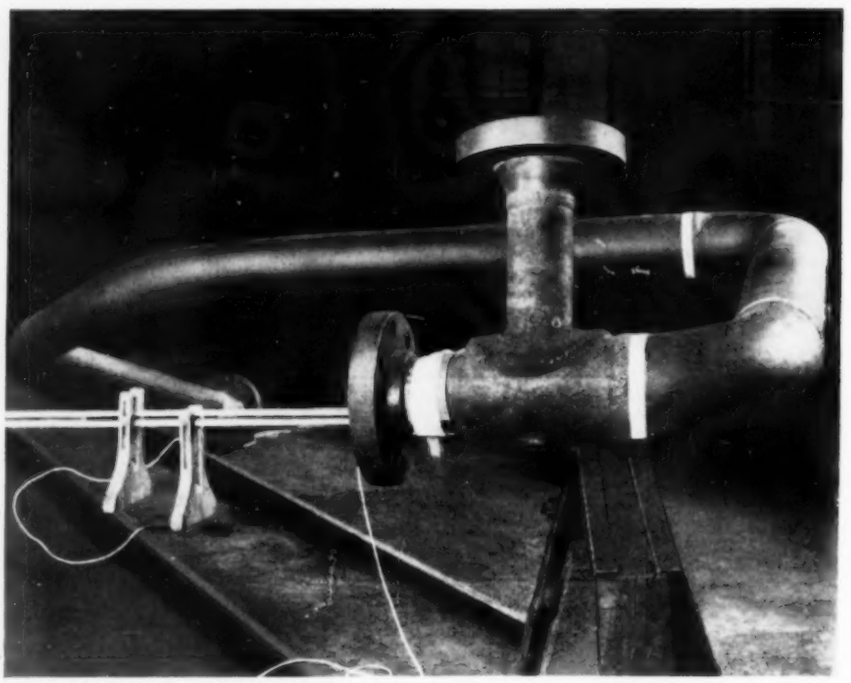

Courtesy Pittsburgh Piping and Equipment Co.

The illustration shows radium being used to take a radium-radiograph of a weld. Placing the radium centrally in the pipe and the film on the outside permits of taking a radiograph of the entire circumferential weld with one exposure. This is just one of the many advantages of the use of radium for industrial radiography.

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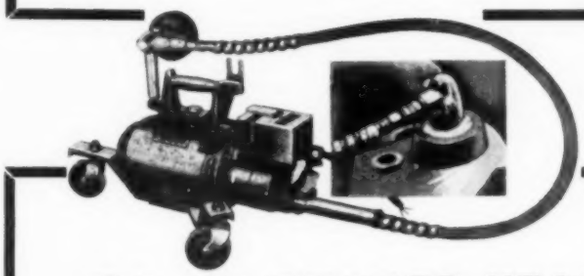

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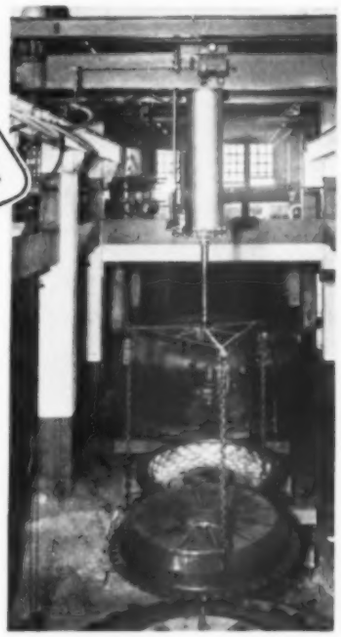

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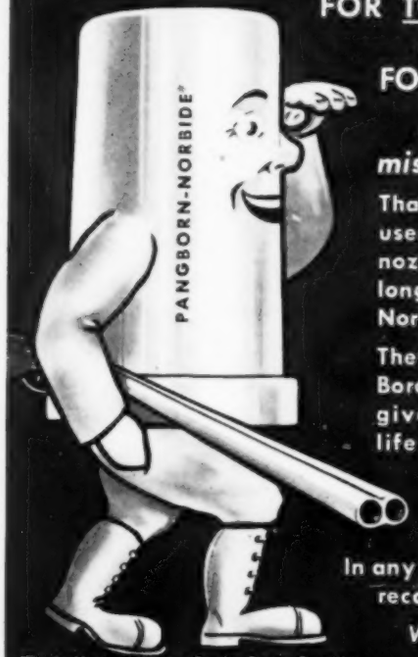

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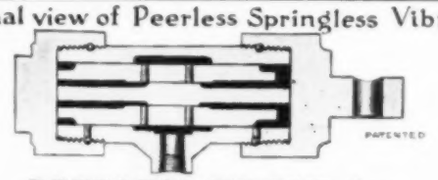

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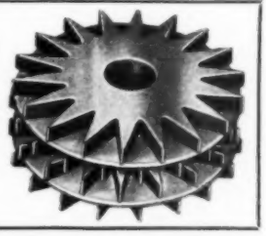

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Thomasville, Georgia

FOUNDRY FOR SALE

Gray iron foundry on main line of B. & M. R.R. with side track. Buildings in fair condition and sprinkled throughout. Plot area approximately 40,000 square feet.

GARDNER TRUST COMPANY
Gardner, Mass.

FOR SALE

Completely equipped foundry and stove factory on railroad siding, now in operation, located in mining town Northern Mexico. Owner wishes to retire to United States. For particulars write to **Mrs. Frances P. Low, Apartado Postal No. 3, Parral, Chih., Mexico.**

FOR SALE

Foundry, hardware specialties, near Reading. Net profit $35,000.00 year. Address Box 559, The FOUNDRY, Cleveland.

GRAY IRON FOUNDRY AND MACHINE SHOP FOR SALE

In heart of oil fields. Select trade, well equipped and stocked. Owner retiring. Box 3266, Whittier Station, Tulsa, Oklahoma.

IRON FOUNDRY FOR SALE

Close to Boston, Mass. Established over half century; employs 15 molders, plenty real estate for expansion. Very low overhead, no liabilities. Foreman and organization will remain intact. Health and age compels owner to retire. An unusual opportunity. Address Box 549, The FOUNDRY, Cleveland.

For Sale

FOR SALE

Used Herman 40" x 50" plain jarring machine, rebuilt in 1937. Address Box 540, The FOUNDRY, Cleveland.

FOR SALE
PANGBORN SANDBLAST BARREL
Type GH1 No. 3
In good condition. Inquire

National Foundry Company of New York, Inc.
10 Sandford Street, Brooklyn, N. Y.

FOR SALE

1—Beardsley and Piper portable type sandslinger, serial No. 90034261, used very little and in excellent condition. Address Box 283, The FOUNDRY, Cleveland.

For Sale

FOR SALE

Chain Hoists
Air Rammers
Air Drills
Air Grinders
Chipping Hammers
Air Vibrators, all makes and sizes
4—Air Hoists, Horizontal Type
3—Air Hoists, Cylinder
1—1000 lb. Worm Gear Ladle
1—1500 lb. Worm Gear Ladle
1—2 Ton Worm Gear Ladle
1—3 Ton Worm Gear Ladle
1—4 Ton Worm Gear Ladle
2—1000 lb. Bull Ladle with Bail
6—200 lb. Shank Double End
6—No. 1 Red Electric Vibrators
6—No. 5 Red Electric Vibrators
6—Red Electric Vibrator Knee Switches
1—Band Saw
1—Drill Press
1—24 x 48 Tumbling Mill Round, 1" Plate Steel
1—SP Clarage Fan No. 70, exhaust
1—42" Cupola
1—Whiting No. 4 Cupola
1—Core Oven, 5 tray, coke fired or gas, 36" wide, 51" high, 31" deep, shelves pull out.
1—Ingersoll-Rand Air Compressor, 10 x 10.
1—Ingersoll-Rand Air Compressor, 8 x 8, Class N.E.I. with 25 HP motor, 220 v.
1—Gardner Air Compressor, size 6 x 6, belt driven with Lincoln motor, 2 HP 220 v.
12—Brillion Iron Pouring Devices
2—Worm Gear Receiving Ladles
1—6 x 6 Curtis Air Hoist
1—Sand Blast Barrel Model A
1—800 lb. Worm Gear Ladle
1—Sand Cutter
2—6' Simpson Sand Mixers
1—8' Simpson Sand Mixer
1—Otis Elevator with 10H motor, 2500 lbs. capacity
2—Grinders Motor driven
1—Royer
1—Gas Heat Treat Oven
1—Stock Core Machine
2—Portable Swartwout Core Ovens, 34" x 34" x 72"
4—Core Racks
1—Blystone Sand Mixer
1—Beardsley & Piper stationary Sand Slinger, never used
Rebuilt Motors, all sizes which are guaranteed
We cast Iron & Aluminum Jackets, all sizes

INTERNATIONAL MOLDING MACHINES

1—type "JW" 14 x 22 x 6" draw
2—type "JW" 12 x 22 x 4" draw
1—type "TJ" 24 x 10, jolt stripper
1—type "R" 24 x 10, hand operated
3—type "HJ" 20 x 6
1—type "HJ" 16x4
1—type "R" 20 x 8

TABOR MACHINES

1—Jolt Squeezer
1—Power jolt, rollover, power draw, portable 22 x 32
2—Tabor Jolt Strippers

OSBORN MACHINES

6—"J75" Squeezers
1—No. 560 Jolt Stripper
1—No. 403 Machine
1—"J74" Plain Squeezer
1—Osborn Core Blower
1—Osborn Squeeze Machine

MILWAUKEE MACHINES

1—Jolt Stripper squeezer
1—Plain Squeezer

HERMAN jolt rollover machines, large and small.

HAYNES FOUNDRY EQUIPMENT COMPANY
1734 Lake street Kalamazoo, Mich.

FOR SALE

15-ton Lucas vertical power forcing press, arranged for motor drive. Address Box 541, The FOUNDRY, Cleveland.

FOR SALE

Barrett F C F bronze melting cupola furnace. Capacity one (1) ton per hour.

William A. Hardy & Sons Co.
Fitchburg, Mass.

MOLDING MACHINES FOR SALE

1 INTERNATIONAL TYPE "F", 31" x 16" DRAW, 2400 lb.

1 HERMAN 42" x 60" IRO 6000 lb. ROLL OVER UNIT, SERIAL IRO-355 AND BUMPER UNIT 40" x 58", SERIAL 1580; EXCELLENT CONDITION.

1 HERMAN 60" x 84" IRO, 10,000 lb. ROLL OVER UNIT AND BUMPER UNIT 60" x 72".

THE MOORE BROTHERS COMPANY
Foot of Bond and Pine Sts. Elizabeth, N. J.

Classified Advertising

For Sale

FOR SALE

1—New No. 2 Simpson Muller—never used—available at once.

2—Rebuilt Royers—good condition—available at once. 16" belts, 30" centers, 3 H.P. motors.

THE E. H. BARDES RANGE & FOUNDRY CO.
2619 Colerain Ave. Cincinnati, Ohio

FOR SALE

One Pangborn Sand Blast
Room Size 9' x 10' with Dirt Arrester
Used very little.
Line Shaft 2 7/8" Dia., 113' Long
With 12 Fafnir Ball Bearing Hangers
One 30 h.p. Motor, 220 Volts, 3 Phase
60 Cycle Motor

WHEELING BRONZE CASTING CO.
WHEELING, W. VA.

REBUILT USED EQUIPMENT

Molding machines, all types; tumbling mills; furnaces; cupolas; air compressors; hoists; rammers, all types; ladles, all types; sand mixers; sand blast tanks; core machines, etc. All equipment rebuilt and guaranteed. All sizes used steel flasks.

HAYNES FOUNDRY EQUIPMENT COMPANY
1734 Lake St. Kalamazoo, Mich.

FOR SALE

1 12' No. 2 Pangborn rotary table sand blast, including all motors and dust arrestor. Inspection invited. For further details inquire **Rock Island Stove Company, Rock Island, Illinois.**

EQUIPMENT IN STOCK REBUILT—GUARANTEED IMMEDIATE SHIPMENT
MOLDING MACHINES

1—International Jarr table 24" x 36".
4—Herman Jarr table 40" x 60".
4—Herman Jarr Strippers 40" x 60".
6—Herman Jarr Rollover Pattern Draw 30" x 42", 40" x 55", 40" x 60".
1—40" x 50" Tabor Jarr Rollover Pattern Draw.

MISCELLANEOUS ITEMS

1—12" x 12" (375-CFM) Chicago Compressor, type NSB belt drive.
1—12" x 10" (360-CFM) Penna. Compressor, complete with 60-HP. C.W. slip ring motor, 220/3/60-cycle.
4—20" and 24" Coombs Riddles 110-VAC.
1—3/4" cap. Shuster Power Sprue Cutter.
2—No. 60 oil fired Fisher Crucible Furnaces.
1—Battery of 3 Young Gas fired core ovens each 12' 6" deep, 8' wide x 7' 6" wide, double doors, 4" insulation.
2—No. 3 Simpson Mixers, 8-ft. diameter.
1—No. 2 Simpson Mixer.
1—Pangborn Sand Blast Room with Dust Arrestor.
1—Sly Sand Blast Room with Dust Arrestor.

ELECTRIC MONORAIL HOISTS

50—1/2 to 5-ton, 1 and 2-motor, Fl. and Cage Operated, 220/440-volts, 3-Ph., 60-cyc. 110 and 230-VDC.

OVERHEAD ELECTRIC TRAVELING CRANES

We have 1 to 50-ton cranes of 22' 0" to 80' 0" spans, 220-VAC and D.C. and operators of the largest exclusive cranes and rebuilding shop in the country. Send us your specifications, we can quote you on a crane rebuilt to your requirements.

ELECTRIC STEEL FURNACE

1—3-ton Heroult, with 1500-KVA transformer, 2300-volts, 3-phase, 60-cycle, REBUILT TO YOUR SPECIFICATIONS.

T. B. MACCABE CO.
4304 Clarissa St. Philadelphia, Pa.

For Sale

FOR SALE

1—60 Sly sandblast tilted mill.
1—Floor jolt molding machine, 54 x 72" table
1—No. 17 American Pulverizer Steel turning crusher
10—No. 91 Arcade squeezers
4—Osborne J 74 jolt squeezers
2—International PJS jolt squeezers
1—Tabor squeeze strip
1—Link-Belt portable carloader conveyor
5—No. 11 Arcade rollovers
1—No. 221 Arcade rollovers
3—No. 22 Arcade rollovers

CENTURY FOUNDRY
3727 Market Street Saint Louis, Mo.

FOUNDRY CRANE LADLE FOR SALE

Average I. D. (Lining) 48"
Average Depth (Lining) 44"

APPROXIMATE CAPACITY 20,000 LBS.
Used, in good condition

THE COX & SONS CO.
Bridgeton, New Jersey

REBUILT CENTRIFUGAL COMPRESSORS

2800 CFM, @ 1 lb. North American Turbo Compressor with 20 H.P., 3600 RPM A.C. motor.

1250 CFM, @ 3 1/4 lbs., 3600 RPM Gen. Elec. with 30 H.P. A.C. motor drive.

450 CFM, 3500 RPM Gen. Elec. with 6.2 H.P. A.C. motor drive.

SAND VIBRATOR

Jeffery-Traylor, shaker type CVS-8, 6" wide hand deck, capacity 7 to 8 tons sand per hour; witn 15 cycle, 110 volt, single phase vibrator motor generator set.

Guaranteed electrically and mechanically to give new performance. Can be inspected, priced for quick sale. Write, wire or phone.

The Motor Repair & Mfg. Co.
1552 Hamilton Ave. Cleveland, Ohio

POSITION WANTED!

HELP WANTED!

EQUIPMENT FOR SALE!

WANTED TO BUY!

FOUNDRIES FOR SALE!

Use the classified columns of The Foundry for quick results!

For Sale

FOR SALE

4—Sly No. 4 tilted sand blast barrels arranged for motor drive.

1—Sly No. 11 unit dust filter complete with fan and motor.

HERMAN L. WINTERER
955 N. Front St. Philadelphia, Pa.

REBUILT
BLOWERS—FANS—EXHAUSTERS

Connersville-Roots positive cupola blowers. Centrifugal blowers for gas and oil burning. Sand blast, grinder and dust exhausters. Ventilating fans.

GENERAL BLOWER COMPANY
406 N. Peoria St. Chicago, Illinois

ELECTRIC METAL MELTING FURNACE FOR SALE

One Detroit Electric furnace, Type AA, 750 lb. capacity; complete with one 200 K. V. A. transformer, oil switch and metering equipment. Available for inspection and immediate sale.

HANSON-VAN WINKLE-MUNNING CO.
Matawan, N. J.

FOR SALE

6980 C. F. M. 2 STAGE, 19 x 12 x 14" CHICAGO AIR COMPRESSOR POPPET VALVE, MV, GCB, SERIAL NO. 5152, WITH IDLER, UNLOADER AND LUBRICATOR, SPLIT BAND WHEEL 7' DIA., 18" FACE, BELT DRIVE. ADDRESS Box 491, The FOUNDRY, CLEVELAND.

SPECIAL FALL BARGAINS

Air Compressor Units—Curtis 6 x 6 twin with 15 HP motor and starter-tank-belt and unloader 87 CFM displacement.

Ingersoll-Rand 10 x 10 with 40 H.P. Motor.

Fans—Blowers—Exhausters for cooling, ventilation and dust or fumes removal. Multivane Fans in all st'd. makes and styles for large air volumes at low pressures.

Fan or **Centrifugal** style blowers—Maxon-Premix—from No. 1 to No. 6, Spencer Turbine, Gen. Electric, Am. Blower Co., Sturtevant, Buffalo, Clarge, Ilg etc. for Gas or Oil fuel Combustion.

Rotary Pressure Blowers—Roots-Connersville, Garden City, Green, Piqua, Sturtevant, Am. Gas Furnace Co. etc.

Cupola 30" dia. shell 3/4 to 1 ton cap. and larger.

Furnaces for Brass and Aluminum Melting—Hausfeld Tilting open flame 400 lb. brass cap.; Booth Electric 725 lb. brass cap. with instruments and transformer. Stationary Furnaces, swing top for crucibles No. 6 to No. 150 and open top for iron pots up to 300 lb. aluminum.

U. S. Size No. 4 Brass melting furnace.

Molding Machines—Osborn-75J, Osborn No. 401 stationary, jolt-squeeze-rollover-draw 20" x 30". Osborn No. 404-S, No. 405-S and No. 85 Pit Type jolt-squeeze-strippers. Arcade No. 3 "Modern" portable hand operated rollover draw, underneatn runout carriage. "Berkshire" 34" wide stationary air squeeze. "Tabor" 8" cyl. air squeeze. "Battenfeld" (Johnston & Jennings) stationary jolt squeeze; 5 in stock. Arcade—portable 2 in stock 8 & 10" cyl. Adams—Stationary hand squeezers 48" wide 2 in stock. Tabor-Air Squeeze Stationary 48" wide, 16" cyl. Mumford—Stationary Air Squeeze 14 x 18" platen. Tabor—Hand operated, portable, Rollover, draw for 20 x 30" flasks or core boxes, 3 in stock. Nichols—10" x 32" Stationary 20 available. Tabor 28" x 42" portable jolt rollover draw.

Crane Ladles 2 & 4 ton, Sly wet Cinder mill.

Sand Blasts—pressure generator tanks with hose & nozzles.

Sand Blast Barrel—New Haven 36 x 46" Motor direct connected.

Sand Blast Table Pangborn 6' dia. self contained fine for brass castings.

Blystone Sand Mixer.

Tell us your needs.

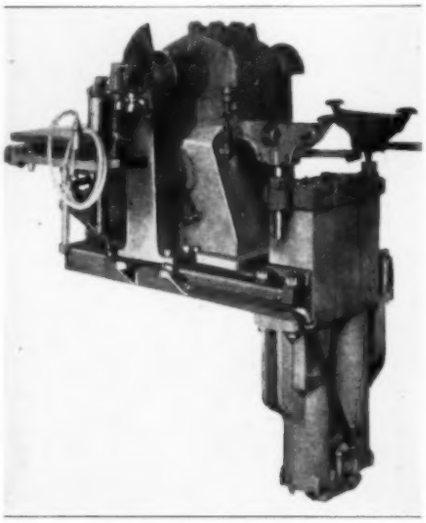
CLIFTON MACH'Y CO. 1023 W. 6th CIN'TI, O.

"SCULLY-JONES" RECONDITIONED FOUNDRY EQUIPMENT

◆ Ready for immediate shipment, this equipment has been completely rebuilt in our modern machine shop. Prices on request.

INTERNATIONAL MOLDING MACHINES

1 49 x 16″ draw Type "F," fitted with air equalizers, rollers in the draw section and hand operated core box clamps, jar plate 100″ long, 6000 lbs. cap.



INTERNATIONAL TYPE "F"
(Enclosed Model)

48 x 16″ draw Type "F"—4200 lbs. cap. @ 80 lbs., table size 48 x 83″.
37 x 16″ (adjustable draw, can be set to max. of 25″) Type "F" table size 34 x 70″, 3800 lbs. cap. @ 80 lbs. press.
31 x 16″ draw, Type "F" table size 31 x 60″, 2500 lbs. cap. @ 80 lbs. pres., with roll-off taile and air equalizers.
42 x 16″ draw Type "F" (with double cylinders) 3400 lbs. cap. @ 80 lbs. pressure.
26 x 8″ draw International Type "F" 22 x 40″ roll-over table.
26 x 12″ Type "F" International 22 x 40″ roll-over table.

OSBORN MOLDING MACHINES

No. 403 Osborn jolt roll-over and pattern draw, flask cap. 44 x 36″, 12″ draw, with swing-out Mold Table.
No. 403-W Osborn jolt roll-over draw, flask cap. 52 x 36″—12″ draw, lifting cap. 1300 lbs. @ 80 lbs. press. with swing-out Mold Table, Power Roll-Over.

MISCELLANEOUS MOLDING MACHINES

Tabor power jolt, power roll-over, power draw, 30 x 40″ roll-over table, 12″ pattern draw.
Davenport No. 28, jolt roll-over draw, table size 27 x 40″, 12″ draw, 1500 lbs. capacity @ 80 lbs. pressure.
Osborn jolt roll-over, 21 x 28″ jolt table, 16 x 43″ roll-over table, 19″ dia. cyl. 8-10″ draw, stationary.
Pridmore hand draw, air roll-over and electric jolt, 33 x 25″ table, direct connected to 2 HP GE 3/60/220V AC Induction Motor.

GRIMES—MILWAUKEE

Grimes Model K-614 roll-over, 6″ cyl. 1000 lbs. cap. @ 80 lbs. max. width of flask 32″ max. length 48″—14″ pattern draw.
No. 832 Milwaukee hand jolt and roll-over, foot draw, portable, 30″ height pattern table, max. draw 8″ 15 x 32″ table.

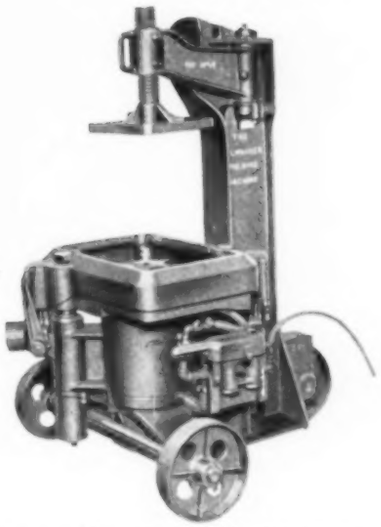
HERMAN BUMPERS

60 x 72″ table, 15,000 lbs. cap. @ 80 lbs. press., 19½″ dia. cyl.
50 x 50″ table, 6100 lbs. cap. @ 80 lbs. pressure.
40 x 50″ table, 6400 lbs. cap. @ 80 lbs. press., 13″ dia. cyl.

JOLT SQUEEZE & POWER STRIP

Nicholls 11-32″ Type "D" stationary 13-23″ pin centers, 10¼″ squeeze piston, 4⅝″ jolt piston.
No. 142 Milwaukee, stationary, stripping cap. 1200 lbs. @ 80 lbs. press., draw 6″ table 19 x 35″—open end type.
No. 152 Milwaukee, portable, max. pattern draw 6″, pattern length 28″ width 20″, 1200 lbs. cap. @ 80 lbs. press., 22 x 30½″ table.
No. 703-6 Osborn jolt squeeze and strip, 21 x 28″ table, stationary, length of opening in lifting frame 34″, 6″ pattern draw, 8″ cyl. dia. 1000 lbs. jolt. cap. @ 80 lbs. pressure, distance from lifting frame to squeeze head 24¼″, flask length 44½″, with roll off conveyor.
No. 703-5 Osborn, same as above excepting 17 x 35″ table.

JOLT SQUEEZE STRIP



Milwaukee No. 113, portable, 500 lb. cap. @ 80 lb. press. 6″ pattern draw, 16″ x 26″ table—platen size 12″ x 14″—max. pattern length 24″.
Milwaukee No. 113, portable, 500 lb. cap. @ 80 lb. press. 6″ pattern draw, 16″ x 35/ table, open end type, platen size 12″ x 14″.

PLAIN AIR SQUEEZERS

No. 10A Arcade straddle type 10″ squeeze cyl. 16 x 18″ table, distance between uprights 32″.
No. 13 Arcade, port. 44″ between rods, 13″ dia. cyl. 20 x 28″ table.
International Type "H" 9-32″ portable, 17 x 18″ table.
Tabor, stationary 36″ between rods, 18 x 26″ table, 13″ dia. cyl.

SAND MIXERS-CONDITIONERS-THROWERS

No. 3, 8 ft. dia., 11 x 32″ heavy duty type double Mullers, arranged for motor drive, but without motor, with gear reduction and outboard bearing.
B & P SAND CONDITIONER, with AC Motor, 12 x 20″ Stearns 230V Magnetic Pulley, 26 x 50″ screen, 15 x 15 x 33″ Iron Hopper, portable.
Universal SAND THROWER, stationary, on bed plate direct connected to 7½ HP 220V AC Motor.

SPENCER TURBO COMPRESSOR BLOWERS

Blower No. 1507, 675 CFPM @ 24 oz. 12″ opening with 7½ HP AC Motor.
Blower No. 1510, 900 CFPM @ 24 oz. 12″ opening, with 10 HP 220V AC Motor.

POSITIVE PRESSURE BLOWERS

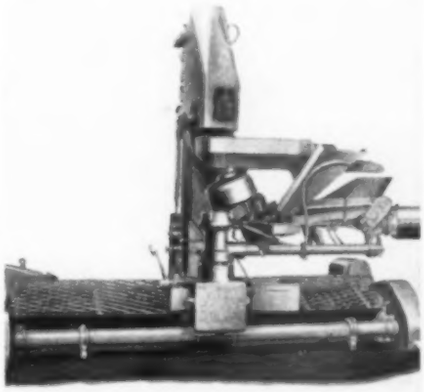
No. 6 Piqua, 35 ft. displ, top discharge, on bed plate direct connected to 40 HP Wagner 220V AC Motor.
No. 5½ roots, 18 x 42½″—displ. 18 ft. @ 4 lbs. press., top discharge, belt drive.

OVERHEAD ELECTRIC TRAVELING CRANES

25-ton Walker, 55 ft. span, with 5-ton Aux. Hoist, Motors 550V DC.
7½-ton New Albany, 48 ft. span, 2-motor Type, 220V DC, cab control.
5-ton Toledo, 31'7″ span, 20″ "I" Beam Girders, 6″ face, 115V DC Motors.
5-ton Bedford, 28 ft. span, Straight "I" Beam Type Girders, cab control, 220V DC Motors, cut steel pinions and gears.
5-ton Shepard 18'5″ span, 1-motor 220V DC, trolley hand racked, bridge hand racked, box girders.
3-ton Shepard, 25'6″ span, 3-motors 220V DC, floor cont., vertical clearance 37″ with 10″ Double "I" Beam Bridge Girders.
2-ton Detroit LoHed Ice House Type, 26 ft. span, 3-motors, 220V AC, floor control, 9-10 ft. lift.
1-ton Detroit LoHed Type "H" Ice House Cranes, 29 ft. span, double "I" Beam Girders, 220V AC, floor control, 9 ft. vertical lift.

ELECTRIC HOISTS

1000 lb. Shepard, 1 HP 110V DC Motor, with Trolley, 14 ft. lift.
1000 lb. Y&T Model 20B, Elec. Chain Hoist, 16 ft. lift, 220V AC Motor.
1000 lb. Box Load-Lifter, 1 HP 220V AC Motor, 15 ft. lift, floor control.
2000 lb. Y&T Model 20B Elec. Chain Hoist, 16 ft. lift, 220V AC Motor, floor cont.
2000 lb. Shepard equipped with 2¼ HP 110V DC Motor, 18 ft. lift, floor cont.
2000 lb. Shepard Lift-A-Bout with Trolley, 2¼ HP 110V DC Zobell Motor, 18 ft. lift, floor control, speed 20 FPM.
2000 lb. Shepard Lift-A-Bout mounted on Cleveland Tramrail Trolley, with 3½ HP 110V DC Motor, 20 ft. lift.
2000 lb. Northern Hi-Lift lug suspension type for fixed suspension, with 2 HP 220V AC Motor, 20 ft. lift.
2-ton Shepard, stationary, with remote cont. for mounting, with 20 HP 220V AC Motor—speed 80 FPM.
5-ton Detroit, with Top Hook, floor cont. with 5 HP 230V DC Motor.
7½-ton DETROIT equipped with 6½ HP Watson 230V DC Motor.



BEARDSLEY & PIPER
TRACTOR TYPE SANDSLINGER

Tractor Type, 19″ head with Screw & Bucket Elevator, track gauge 11 ft., ramming cap. 7-10 CFPM, 220/440V AC Motors.
Tractor Type, 7-10 cu. ft. cap. 16″ head 5 ft. jib, 4 ft. arm, 440V AC Motors, push button.

MISCELLANEOUS

Long & Alstatter heavy duty type Power Sprue Cutter, 1 x 2″ cutters, 6″ long, 13″ depth of throat.
Automatic Platform LIFT TRUCK LA-6000 lb. cap., 24 x 48″ platform, worm geared drive with Batteries, height from ground when raised 10.″
350 lb. DETROIT Rocking Type ELECTRIC FURNACE, 200 KVA, 2700V, 90V Sec.
Excelsior Double Spindle Automatic GRINDING & POLISHING MACH, grinding cap. up to 60″ sq., pulley drive.

Above items represent but a portion of our used or reconditioned FOUNDRY and INDUSTRIAL EQUIPMENT BARGAINS . . . Send for our current STOCK LIST No. 69 (just printed) which shows COMPLETE STOCK on hand at our CHICAGO WAREHOUSE and advise as to your exact requirements.

SCULLY-JONES & COMPANY **(Foundry Division) 19th & ROCKWELL STS. PHONE LAWNDALE 8770 — CHICAGO, ILLINOIS**

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